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LIGHT ⁂ HEAT ⁂ POWER ⁂ BYE-PRODUCTS

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Editorial Notes.

Centenary of the Institution of Civil Engineers.

THE gas industry has formally offered its heartiest congratulations to the Institution of Civil Engineers on the centenary of their incorporation by Royal Charter on June 3, 1828; and we do so most cordially now as probably the oldest engineering paper in existence. It is fitting that a chemical engineering industry with a record of 120 years should be prominent in connection with such an event, for the Charter of the Gas Light and Coke Company ante-dated that of the Institution by several years, and we do not know of any other industry that can claim the same historic coincidence. To the mother of engineering institutions there came for the centenary celebrations delegates from engineering societies in all parts of the British Empire, as well as delegates from similar organizations in foreign lands, and professional societies and universities. Science knows no bounds—geographical or national. It was all a delightful recognition of birthright and seniority; and it showed devotion, reverence, and respect; it certified to a record of scientific and technical contribution and work which is without compare in the annals of the technical organizations of the world.

During the centenary week, there were several conferences on various subjects. On the Monday the President, Mr. E. F. C. Trench, delivered his address. In the afternoon, Sir Alfred Ewing delivered the 34th James Forrest Lecture; his subject aptly being "A Century of Invention." It is a striking fact that at the various conferences there was little retrospection; and the point is worth noting in these times when men's minds are bent on the future and on development. The subjects dealt with mostly marked the current stage in the solution of certain engineering problems—milestones (so to speak) in the great and complex problems of engineering. The fuel and carbonizing industries, for instance, last Tuesday week treated of solid and liquid fuels, coke-oven and town gas, and waterless holders—all from the point of view at which they stand as modern problems, although by no means exhausting the list of subjects with which we have to deal. Each subject foresadows development in the quest for securing in industry greater economy and efficiency—the carbonizing industries want to contribute more to our independence in respect of oils and spirits; the coke-oven industry wants to make better use of its surplus gas; the gas industry is out to ascertain where among its engineering constructions its designs are susceptible to reliable improvement to realize not only economy but efficiency in operation. Both subjects are constituents of the polemics of the times, because on the one hand the coke-oven people desire to be the source—or a large source—of gas supply to the gas industry; and, on the other hand, the makers of waterless holders of the type at present best known to us continue to maintain, in the face of criticism, that no part of the design is likely to prove a weakness.

Dr. Ewing's lecture dealt, as already said, with a century of invention. During the century the gas industry can claim to have made a very good contribution to the engineering and chemical inventions of the times and, especially during the past two or three decades, the industry has devoted itself to promoting the acquisition of that knowledge which forms part of the profession of civil engineering—"the art of directing the great sources of power in Nature for the use and convenience of man." The industry has tried to pursue that art successfully. Its very extension of service shows it; for if it had not through invention and discovery increased its economies and efficiencies in process and utilization, it could never have made the extraordinary progress in service that it has done, especially during the past four or five decades, since electricity has been in the running. We hope Dr. Ewing is not right in his prognostication that there is likely to be a lull in the revolutionary fervour of the engineer. Social changes—drastic social changes—may be looked for; but not, he thinks, so directly consequent on the activities of the engineer as in the century now ended. We will suggest one social change which the gas industry is hoping will come about, and is working for ardently. That is the conversion of domestic heating to gaseous and smokeless solid fuel. If that eventuates, it will make the coming century a remarkable one, and give our engineering successors something of which to talk at the next Institution centenary. It, of course, depends on many things—both internal to the industry, and external to it. But external to it, we see new generations springing up, to whom home life is not the same thing as it was in the reign of Queen Victoria. We see the desire for more outdoor life, for less labour in the home, and for more freedom. That is a healthy desire; it all tends to a purer and healthier atmosphere.

Fuels—Disposal of Coke-Oven Gas.

WE may pass to a brief reference to Dr. C. H. Lander's paper on the Utilization of Solid and Liquid Fuels. It was Sir Richard Threlfall who recently said that smokeless solid and liquid fuels were only the half-way house to the ultimate goal of gaseous fuel. There is one remark in Dr. Lander's contribution which stands out from among the rest. It is: "Gas is the fuel of greatest availability; "and the fuel which, generally speaking, can be utilized to "the highest efficiency." Whatever is done in the way of pulverization, or in hydrogenation, and in obtaining by low-temperature carbonization liquid fuels and spirits from coal, that simple fact will stand out clearly and unchallenged. We have the fuel of greatest availability, most easily handled, and capable of application with the greatest efficiency. An interesting piece of information was elicited by Dr. Cullen when he charged the Fuel Research Station with giving an undue amount of prominence to low-temperature carbonization. Dr. Lander,

however, was able to assure him in reply that not more than 25 p.ct. of the expenditure of the station is on low-temperature carbonization, while 50 p.ct. is spent on high-temperature carbonization. But a larger subject affecting the interests of the gas industry was raised by Mr. Robert Ray. We know how the coke-oven industry has been trying to get outside the gas industry in respect of the sale of its gas; and this the gas industry cannot allow. But Mr. Ray now suggests that there ought to be good business doing, through the gas industry, among industrial consumers for the crude gas of the coking industry. That, of course, depends upon the geographical situation and the density of the industrial demand. Otherwise, it would be far better to purify the gas and utilize it for domestic purposes. We are not in agreement with all Dr. E. W. Smith had to say on this question. He thought it would be an excellent thing if there was greater co-ordination of a national kind existing between the gas industry and other fuel users and producers, "even if it went so far as suitably adapted Gas Commissioners who would have the right thoroughly to explore such problems as the utilization of coke-oven gas for town purposes, amalgamation of small and large gas undertakings, working agreements, and so on on the lines of the Electricity Commissioners." We hope Dr. Smith will not again make that suggestion. The idea has been talked about, thrashed out, and discarded a dozen times at least. No one wants Gas Commissioners lording it over the gas industry. The American gas industry knows what it means; the electricity industry at home is not altogether happy over its control. In America the gas industry has been held back by tradition and precedent when it wanted liberty; and the electricity undertakings at home have not been universally enamoured over the decisions of the Commissioners, and there has been open rebellion, and even law cases. But about the sale of coke-oven gas for industrial purposes, both Prof. Henry Louis and Prof. Bone are of opinion that a serious mistake was made in locating the coke-ovens at collieries, instead of at the iron and steel works where gas as well as coke could have found profitable use. Mr. Ray admitted that it was a pity the mistake of location was made. What trouble might have been saved if coking plants had had different location during the strikes, and the miners' leaders had got it into their heads that such plants were not part and parcel of the mine equipment, but separate entities. Incidentally, Mr. Ray gave some striking figures with regard to a long experience with a gas engine and coke-oven gas, which gave electricity at 0·3d. per unit; and with a gas-engine installed two years ago, the cost is a trifle over 0·2d. per unit. Can the electricians beat that? If not, then they will not get Mr. Ray for a customer, though the grid pass his door.

Waterless Holders.

THOUGH it cannot be said to be the greatest invention of the century with regard to gas-engineering structures, the waterless gasholder is perhaps the latest achievement in structural gas engineering. It fell to the lot of Mr. Frank Prentice, of Ipswich, to give the conference information on the subject. He told how the invention is something more than a mere structure; it is a machine. Among the favourable points are the reduction in weight through the absence of water in the tank, the saving in the cost of foundations, constant pressure (which can be varied to meet requirements), suitability of such holders for areas liable to subsidence, reduction in cost of painting, and so on. We can quite understand that in situations where the foundations are bad there would be a saving—for instance, in a case where the weight of a water tank would require a large amount of piling; but otherwise, as Mr. George Evetts says, there is not much in the point. However, this waterless type of holder certainly marks an important stage in the history of holder design; for it means a departure from the hitherto accepted principle that we cannot do without telescoping and a water seal; and credit must be given to Herr Konrad Jagschitz for the engineering ability he displayed in discarding those principles when designing the new holder. But Mr. Thomas Hardie and other engineers, while giving all credit for the design of the shell of the holder, are not prepared to consider that the sealing of the piston is final, though the tar seal is a vital item in the present design. That seal and the pumps are the weaknesses of the system in the eyes of such old gasholder designers as Mr. R. J. Milbourne and Mr. Samuel Cutler; and if we can get away from them, and to something that appears more reliable, then the waterless holder would have a more speedy adoption among British engineers than appears to be likely at the present time. There is promise that we shall do so; and Mr. Cutler looks hopefully to the Klonne patent. We agree with him that if the tar seal can be cut out by a sliding joint, with the consequent abolition of the need for pumps and constant supervision, then away go the chief points in the criticisms that have been levelled against the tankless holders. Eight holders are at work in Germany on the Klonne system; they are circular in form, and need no more supervision than the ordinary form of holder. Such is his faith, however, that, with the experience he has had, Mr. Prentice is satisfied his holder—with its reputed faults of tar seals, pumps, extra supervision, &c.—is a great advance on anything on the market, which sweeping assertion, of course, includes the Klonne holder. On the other hand, Mr. Cutler looks upon the Ipswich example as "a passing phase" in a new order of gas storage. Interest in these two opinions will be intensified with the flow of time. But there are some people who believe the Ipswich type of holder, with its tar seal, pumps, and so forth, has come to stay; for in an engineering works in the North (it is said) elaborate machinery has been installed, so that this type of holder can be produced as cheaply as is possible. It is all very interesting in the history of gasholder construction. But though we may have views, based partly on experience and partly on theory, we must wait on time to give us the verdict of professional preference, in which holder conduct and running costs will be important persuading factors.

Over-Production of Nitrogenous Fertilizers.

THE significant statement was recently made by Sir Alfred Mond (this before the new dignity was conferred upon him) that he had been abroad in conference with producers on the subject of how best to increase the demand for nitrogenous fertilizers. In such work lies the commercial future of fertilizers of all kinds. It is no use making any commodity in excess of the consumption, and the cultivation by educational means of demand for fertilizers is better than having to reduce prices to below their economic levels to effect the same end. The statement of Sir Alfred, though it did not impart much information, is satisfactory from the points of view that it shows that even synthetic producers are getting somewhat perturbed over the already excessive production, and that it indicates the willingness of the large makers to get together to see what can be done in the current circumstances, which include schemes for extending synthetic nitrogen plants. To enlarge the world's production unnecessarily or to a serious extent would be madness if commercial prices are to be upheld. A correspondent in the "Times Trade and Engineering Supplement" states that, while recent conversations between large synthetic concerns may prove of importance, it is difficult to visualize a world agreement on nitrogen prices. He adds: "It is reported that, as a result of "these discussions, both the Farbenindustrie I.G. and "Imperial Chemical Industries, Ltd., have decided not "to expand their production of synthetic nitrogen until "there is a better prospect of increased consumption. "Perhaps the most important thing is the way rival "interests have shown an ability to give and take, and, "even if progress has been more marked on technical and "propaganda matters, the friendly atmosphere augurs "well for future conversations on larger issues." Meantime the production of Chilean nitrate is increasing considerably; and the Chilean Government are helping the industry in a very effective manner. Although they have made no change in the export duty, they have refunded approximately £250,000 to producers *pro ratâ* on their January-March output; and it is stated that a bonus will be granted to Chilean producers equal to any reduction that may be made in the cost of synthetic nitrogen. There seems to be good ground for the various interests coming to an agreement in respect of production; but the difficulty is that this would not prevent in any country fresh operators adding to the output capacities of the existing synthetic plants.

The Need to Obtain Success for the Electricity Scheme.

Is the gas industry fully alive to the fact that the scheme for the concentration (some people call it "rationalization") of electricity generation and transmission in this country has already had the plans for three of its zones passed by the Central Electricity Board—the Central Scotland, the South-East of England, and Central England—and the constructional work connected with the first two is under way? The fact anyway does not seem to disturb it much; but it must make no mistake as to the position. It is realized that, so far as obtaining uniformity in electric power production throughout the country goes, no criticism could be made of the scheme; but the generation and the auxiliary cost of radiating the energy from the large super stations form only one side of the question. We have had it from Mr. Archibald Page, the Chief Engineer of the Central Electricity Board, and President of the Institution of Electrical Engineers, that, unless the distributing undertakings do their part in obtaining new consumption, the great scheme will not produce all that its originators hoped for. We get very much the same view expressed in an article which Mr. Hugh Quigley has contributed to the "Daily Telegraph." He is full of praise regarding the generating part of the scheme; but we find ill-forebodings lurking in his mind respecting the distribution end. And distribution is really the dominating factor in the whole of the project. Just think that in Great Britain transmission and distribution already represent more than 52 p.ct. of all capital expenditure, and that percentage is likely to ascend with the creation of the grid. These and other considerations lead Mr. Quigley to show that "in the national scheme the position may be reached where the inefficiency and waste incurred by distributing undertakings may cause the price of electricity to the ultimate consumer to be too high to justify widespread use." The danger of failure in this regard is something that is unknown to laymen—even to the specialists who advise from the Stock Exchange. Already there has been a great deal of speculation in electricity shares in the belief that the supply undertakings are going to get supplies at below present producing costs, and will be able to maintain their charges to the consumers—thus reaping a greater harvest of profit, to the advantage of the shareholders. It is overlooked that all the work that is being done has got to be paid for, that it will take time to bring the scheme to maturity, and that, if business is to be greatly enlarged, there must be big expenditure on the local distribution systems.

With all that is being done, even Mr. Quigley—ardent electrician that he is—is not satisfied there will be success. "If," he says, "at the end of a decade, we find a magnificent national transmission system radiating from the giant power plants, but with the centres of demand still concentrated in the populous industrial areas, with no extensions into agriculture, and no indications of a greater diffusion of industrial activity; if we find the small undertaking still serving its limited area, with no desire to expand further or amalgamate with other undertakings to develop the power market on scientific lines, we must conclude that the national scheme has failed. *There is a serious prospect that it will fail unless rapid changes take place.*" Mr. Quigley's spirits seem to droop as he contemplates the situation. There are in the country at the present time 650 distributing undertakings, each with a narrow range of activity, each self-contained, and determined to obtain the highest margin of profit which its limited market will permit. A recent estimate has given the average area of supply at 20 square miles per undertaking; and according to this calculation, not more than 20 p.ct. of Britain's territory is effectively developed from the electrical point of view. His picture of the future is that, unless a radical change occurs, in twelve years' time there will be at the producing end order obtained through scientific co-ordination and rationalization, and at the distributing end chaos. And his pessimism grows more striking as he proceeds, and he foreshadows the work of a generation before the conditions will be equal to what he regards as necessary for the success of centralized generation and the transmission grid. So far, "the industry has been, and is, concentrated in the densely populated industrial areas, where demand can be easily and profitably met, and the wide agricultural areas have been wholly neglected. Yet the problem of the future lies in the opening-up of these areas prior to the revival of agriculture, the broader diffusion of industrial production, and the repopulation of rural districts, and this problem can only be solved by the construction of large-scale distribution systems radiating from the existing centres of demand." And Mr. Quigley adds that, unless amalgamation and rationalization take place in distribution as well as in generation and transmission, it is difficult to feel optimistic about the future of the national power scheme.

So much for Mr. Quigley's views. They are commonly held in the electricity industry. There is a feeling that the national generation and transmission scheme is going to overwhelm the distribution part of the industry. In other words, the latter is in an immature state for carrying the load the Government has put upon it. It will require much work and time to bring the distribution section up to a state in which it will show fitness for the generation and transmission section. The chances of this being done will depend on the enterprise of the existing distributors. The great encouragement to this will be the desire of the managers of the hundreds of stations divested of generating plants to justify their continued tenancy of their offices at the same rate of remuneration. Having regard to this, despite Mr. Quigley's dull views, the gas industry must not allow itself to be lulled into a state of security from intensified competition. That must come. The electricity industry knows its future depends upon securing large increases in business. And it is aware that its necessity, and the increased efforts to get a big extension of business will be met by a greater intensity on the part of its business rivals.

Railways and Long Distance Gas Supply.

According to a German correspondent, the German railways are, in anticipation of a loss of revenue from coal traffic, opposed to a further extension of the system of long-distance gas supply from the coke-ovens. They are also making what are regarded as exorbitant charges wherever a pipeline has to cross a railway track. Pipe laying is said to be proceeding at the average rate of 100 miles monthly.

Redistribution of Coal Production.

The International Labour Office has issued a report containing the results of its inquiry into the phases of the coal industry in various countries. The world's actual production of coal is equal to that of 1913—the last normal year before the war. But in 1913 the three greatest coal producing countries of the world—the United States, Great Britain, and Germany—accounted for 82 p.ct. of the total world production. To-day, they only produce 77 p.ct. Meanwhile, the production of France, consequent upon the reconstruction of the mines in the devastated area, steadily increases, and that of Holland, previously negligible, is also growing. Furthermore, the mines in Australia, in South Africa, in India, and even in China, are beginning to occupy a considerable place in the statistics of output. This change coincides with certain phenomena which tend to diminish, at least temporarily, the consumption of coal. There has been the industrial crisis, and there is the greater efficiency with which fuel is used to-day. The world is consuming less British coal to-day; and the reasons are larger production by other countries, severer competition, and greater efficiency of use.

Companies' Bill.

The amendments to the Companies' Bill, designed to amend the Companies' Acts, 1908-17, were finally disposed of by Standing Committee B of the House of Commons last Thursday, and the Bill as amended was ordered to be reported to the House. One of the last questions discussed was the responsibility of directors of public companies for the correctness of the stock valuation figures supplied to the auditors of balance-sheets. What was desired was to prevent over-valuation of stocks; but the President of the Board of Trade thought it would be a mistake to make directors responsible for stock valuation, which should be done by departmental managers.

Rating and Valuation (Apportionment) Bill.

The second reading of this Bill was carried last Thursday by 308 votes to 108; and the measure was committed to a Committee of the Whole House. The financial resolution to enable the proposals of the Bill to be carried out was passed by 246 votes to 103.

The "B.C.G.A." and Refrigeration.

With a timeliness which one is wont to associate with the British Commercial Gas Association, they are assisting in no small way to bring before the public the latest use for gas—that of refrigeration. In last week's "Journal" mention was made of a fortnight's campaign during which the gas industry may help matters along by intensive showroom displays. This campaign, of course, was in connection with the only refrigerator which at present is operated by gas, and is to be regarded merely as supplementary to the persistent and continuous campaign on which the British Commercial Gas Association are now embarking, and regarding which they are to be congratulated—not for the first time—on seizing an opportunity for enabling the public to appreciate the modernity and ever-increasing utility of gas. We have no doubt that the lead which the "B.C.G.A." are giving in this important question will be backed-up by gas undertakings throughout the country, not in a spasmodic manner, but persistently, for the voice of the public is never heard at its best on the striking of the first chord. One fact regarding refrigeration should be stressed. A country enjoying—or otherwise—a climate such as that of the British Isles will, after the regulations regarding the use of preservatives come into force on July 1 next, need refrigeration not only during the summer months, but generally throughout the year.

Gas-Operated Refrigerators for All Purposes.

By the introduction of the gas-operated refrigerator, labour-free and motorless refrigeration has become available not only for domestic use, but for every institution, establishment, or business in which perishable foodstuffs have to be preserved. As to business premises, it has been pointed out by the British Commercial Gas Association, in connection with the "campaign" now in progress, that most provision merchants have from time to time suffered considerable losses due to their holding perishable stocks the demand for which has not come up to expectations. Particularly in popular seaside or riverside towns, which depend greatly on the weather for the number of visitors each day, provision merchants find it most difficult accurately to gauge in advance the demand for food. With the gas-operated refrigerator, this difficulty is overcome. It reduces losses in two ways. First of all, it prevents surplus food from deteriorating or becoming absolutely unfit for consumption. Secondly, it eliminates "end-of-week" sales of food at low prices. Coming to domestic users, one notes with satisfaction the fact that Western Mansions, Ltd., who own about 200 high-class suites of residential chambers which were built some 35 years ago, are modernizing these suites as opportunities occur, until finally they will be some of the best equipped in London. Each suite will ultimately have a constant supply of hot water, partial central heating, and gas cookers and fires. All kitchens, pantries, and larders are being provided with tiled walls; and every one of the 200 kitchens will eventually have, as standard equipment, a gas-operated refrigerator—included in the rental of the suite. In fact, so popular with intending tenants are these gas-operated refrigerators that the management have had a sample one fixed in a waiting room for everyone to see. The firm are to be congratulated on their foresight in this matter, for those of the professional class do not always feel justified in meeting the capital cost which a refrigerator entails.

Reception Committee for the Cardiff Meeting.

By an unfortunate slip, a wrong name was applied to one of the photographs on p. 659 of last week's "Journal." The majority of the members of the Institution will have already noticed the mistake; but for the benefit of those who may not be personally acquainted with him, we would point out that No. 9 photograph is that of Mr. W. Clark Jackson, A.M.I.Mech.E., Engineer and Manager of the Neath Corporation Gas Department.

PERSONAL.

Retirement of, and Presentation to, Mr. Alexander Smith.

The retiral of Mr. Alexander Smith, M.Inst.C.E., Manager of the Tradeston Gas-Works, after forty years' service, calls for a brief comment of his valued services to the Gas Department of the City of Glasgow. He claimed his option to retire under the Superannuation Scheme; and so, to mark the occasion, his staff and workmen presented him with a double cabinet book-case and a cut crystal bowl on stand, as a memento of his 24 years' service as Manager. The staff of the Gas Department also gave a handsome solid silver salver, suitably inscribed, along with a silver tea service for Mrs. Smith. The presentation was made on May 30 by the General Manager, Mr. J. W. McLusky, who bore testimony to Mr. Smith's loyal service to the Department. He was supported by Mr. Walter Grafton and the other Managers, who favoured the company with some interesting and amusing reminiscences alike creditable to Mr. Smith. Mr. Smith feelingly replied, and thanked the donors for their handsome and generous gifts.

Mr. Walter Tapper, A.R.A., has been elected President of the Royal Institute of British Architects for a second year.

EVENING STAR LODGE, No. 1719.

The regular meeting of the Evening Star Lodge, No. 1719, was held at Freemasons' Hall, Great Queen Street, London, on May 23, the Worshipful Master, W.Bro. Arthur L. Croager, presiding.

The usual preliminary proceedings having been observed, it was announced that Bro. Fussell had been appointed Asssistant Secretary of the Lodge; and he was duly invested in that office. In the unavoidable absence of W.Bro. Rae P. Normand, P.M., the Secretary, Bro. Fussell officiated for him.

Bro. Harold Temple Abady was raised to the degree of M.M. by W.Bro. Arthur Valon, P.M., L.R.; and Bro. Robert Grant was elevated to the same degree by the W.M., W.Bro. Croager.

Bro. William Ronald Edgar and Bro. David Edward Terrace were passed to the degree of F.C. by the W.M.

It was intended to present W.Bro. E. G. Smithard, of King's Lynn, with the regalia appertaining to the distinction of London Rank, to which he has recently been appointed by the Grand Master (H.R.H. the Duke of Connaught); but he was unfortunately not present to receive it.

After the Lodge meeting, the members and their guests dined together in the adjoining Connaught Rooms.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

June 20.—Southern Association of Gas Engineers and Managers (Eastern District).—Meeting at No. 28, Grosvenor Gardens, S.W. 1, 2.30.

June 21.—Society of British Gas Industries.—Luncheon to the members of the Council, by invitation of the Chairman, Mr. R. J. Milbourne, J.P., at the Grosvenor Hotel, Westminster, S.W., at 1 p.m.

June 29.—Waverley Association of Gas Managers.—Annual meeting in the Chambers Institute, High Street, Peebles. Presidential Address of Mr. George Urquhart (Tranent). 11 a.m.

July 4-5.—Association of Statutory Inspectors of Gas Meters.—Annual conference in Birmingham.

July 9-12.—Association of Public Lighting Engineers.—Annual meeting and conference in Sheffield.

The Institution of Gas Engineers.

All meetings take place in the Council Room at 28, Grosvenor Gardens, unless otherwise stated.

June 15.—Excursion to Tintern Abbey, &c., leaving the City Hall, Cardiff, at 9.30 a.m.

July 9.—Emergency and Finance Committees and Benevolent Fund Committee of Management in the morning; Council meeting in the afternoon.

July 10.—Gas Education Committee.

Sept. 10.—Emergency and Finance Committees and Benevolent Fund Committee of Management in the morning; Council meeting in the afternoon.

Oct. 8.—Emergency and Finance Committees in the morning; Council meeting in the afternoon.

Oct. 9.—Gas Education Committee.

Nov. 12.—Emergency and Finance Committees in the morning; Council meeting in the afternoon.

Nov. 13.—Executive Committee of Gas Education Committee.

Dec. 10.—Emergency and Finance Committees in the morning; Council meeting in the afternoon.

Dec. 11.—Executive Committee of Gas Education Committee.

ELECTRICITY SUPPLY MEMORANDA.

To Instruct Householders.

THE "Householders' Supplement" is a new venture of "Electrical Industries." Being a "Householders' Supplement," we assume it is intended that it shall reach householders; but how it will do so is not clear. Its appearance also suggests that the pre-existing literature on the subject falls far short of what it should be. If this is so, it is a reflection, among others, on the Electrical Development Association. We cannot go through the Supplement page by page to review it; but we have read one of the contributions, which does not say anything very wicked about gas, but does invite a few comments. It is by Victor W. Dale. He tells us that in this year of grace, financiers find electrical securities really most attractive, and the nation is calmly contemplating an expenditure of no less than £250,000,000 upon reorganizing and increasing the public service of electricity. Of course, the nation is not contemplating, calmly or otherwise, anything of the kind. The whole of these millions is an obligation of the electricity supply industry, and the money for the charges and liquidation of principal that it involves will have to be found by the industry from the revenue derived from consumers. Mr. Dale asks, in view of these things: "Is it not really extraordinary to find that it is necessary to preach the gospel of domestic electrification with greater insistence and intensity than was necessary twenty years ago." There is too much "necessary" there; but we will leave it. The fact of the matter is electricity has been found out, and people are now aware that it is not all it has professed to be. The garb in which it has been dressed by its apostles has not found complete justification in daily experience. That is why it is necessary to preach the gospel of domestic electrification with greater insistence and intensity now than twenty years ago; and it is why Mr. Dale cannot deny that 85 p.ct. of the population is still missing what he terms "the major benefits and advantages of electrical scientific development." He speaks of the Britisher's preference for the open coal fire; and then adds: "All things properly considered, there is a far greater amount of unblemished comfort and cheer in the modern electric fire than there is in any old-fashioned open grate." But what else is there besides "unblemished comfort and cheer" in the modern electric fire? The uneconomy of its work as a heater is one of its striking features, and that is one reason why insistent and intense preaching is required in the effort to induce people to think of the "unblemished comfort and cheer," and to discharge from their minds the expense of getting it.

Something Wrong.

Passing on, we find Mr. Dale quoting the numbers of electricity consumers in other countries compared with the number in this one. He does not mention any of the factors which go to swell the differences—such as larger populations, water power, native coal or otherwise, a live gas industry with reasonable prices per therm, all of which make a great difference in the enrolment of patrons for a particular service. Mr. Dale urges the establishment of "price confidence;" and then ends his article by a few harmless comments on the various domestic applications of electricity. We will only allude to one point. He says that for cooking, "at a penny, or less than a penny, per unit, the consumer is on a winner. At any higher charge, and to compare with gas, a rate is economic when the price of a unit of electricity is not greater than one-eighth the price of a therm, or one-thirtieth the price charged per 1000 c.ft. One-eighth of a therm is 12,500 B.Th.U.; a unit of electricity is equivalent to 3412 B.Th.U. We will leave Mr. Dale to place upon his veracity a suitable epithet. The efficiency of electricity would have to be nearly four times greater than that of gas to justify his statement. And a well-known electrician assured us in print the other day that the efficiency of the enclosed hotplate was, when new, only about 36 p.ct.!

"E.D.A." Literature.

Some of the literature that emanates from the Electrical Development Association is such sheer piffle that when it is brought to our notice we wonder why people have such peculiar notions as to the class of literature that will grip the public and convert them to the way the author or authors would have them go. And we also marvel at any responsible electricity managers—providing they are equipped with normal brains—purchasing some of the literature for distribution among the public. We should imagine that most intellectual householders, on seeing certain of the samples, would at once say: "If you have nothing more definite to tell us than this, and cannot tell us in a better and more convincing way, then here it goes into the waste-paper basket." Many distributors of literature among the public have yet to learn that some forms do more harm than good. What it seems to us "E.D.A." does in respect of this literature is to indulge in general statement and invite application to them for more precise particulars. We have one circular in a batch before us which urges householders to wire their houses. It tells the reader that electricity is not expensive; that it saves more than it costs. But there is nothing said to demonstrate the truth of these general assertions. It urges people to indulge in an electric wiring installation, which "costs little, if anything, more than the paper and paint required for decorating the house." What does that mean? Anything can be spent, from a small sum to a very high one, on redecorating a house. Another equally informative leaflet is about ironing. Perhaps better ones are "Don't be Old-Fashioned, Mother." This has to do with the servant problem; and on the back is a statement headed: "An Electric Servant's Wages Bill." It assumes the cost of a unit of electricity at 1d., and follows this up by saying: "Electric suction cleaner, four hours' use for one penny; electric washing and wringing, four hours' use for one penny; electric floor polisher, ten hours' use for one penny; electric irons, from two to four hours' use for one penny; electric sewing machine, twenty hours' use for one penny." Quite useful is the leaflet, "How to Obtain a Supply of Electricity." But the most idiotic of the whole batch is a folder, faced with the words, "How you can Reduce your Gas Bills." When the folded inset is opened, the investigator finds the words: "Use Electricity." Childish and commonplace! Of course, if a householder uses electricity wholly, he can not only reduce but abolish his gas bill, while adding considerably to his account for the same service.

Easily Gained Electricity Business.

There is nothing so easy as the promotion of electrical expansion in any department of application. All that is necessary to speed-up the rate of progress is to have a general campaign. In such circumstances, there should be no limit to the development of the electrical business. Development is therefore (so to speak) on tap. All the electricity interests have to say is: "Let us develop," then hold a campaign, and the business rolls in. We learn this from an editorial in the "Electrical Review." It tells us that most applications of electricity tend to expand naturally—"electric lighting, because it has no rival in the direction of artificial illumination, electric ironing because of its ease and safety, electric driving on account of its flexibility and absence of trouble to the user, and electric cooking and heating because of their cleanliness and controllability." Then we get the declaration: "Convenience is, of course, a factor common to all these and other applications. On this account a general electrical campaign is all that is necessary to speed-up the rate of progress in all the departments mentioned." The British Electrical Development Association have held two six months' campaigns—in other words, half the time of the last two years has been spent in campaigning; but there has been no extraordinary upheaval as the result. The gas industry still goes on expanding, and as a sort of side issue in the day's work is constantly replacing electric cookers, heaters, and other apparatus by gas-using types. But what our contemporary really wished to explain is that, apart from ordinary business, there are certain uses of electricity which are of a special nature; and to stimulate interest in them specialized efforts are necessary. Hence the electrical refrigeration campaign which is now being held—from June 8 to 25.

"Got the Wind Up."

A defective electric wiring installation and its renewal was the subject recently of an action in the East Grinstead County Court before His Honour Judge Owen Thompson. The condition in which the installation was found is probably only an illustration of many others throughout the country; and, if so, householders are living and sleeping in immediate danger of an outbreak of fire. The plaintiffs were Mitchell Bros. and the defendant Maurice Greenhill, of Furness Farm, Hartfield. One of the Mitchells was working on a hot-water system on the farm; and, having to take up some floor boards, he exposed the electric light wires. In the dining-room, he found a floor board charred, while in several cases the wires were bare. He told defendant this state of things was not safe; and the latter "got the wind up." It was agreed that the wiring should be put right at 18s. per point. Every circuit, except one, was found defective. Altogether there were 82 points, of which 77 were rewired. Defendant allowed the work to proceed, but afterwards said he should only pay for 38 points. Judge Thompson was not satisfied with the evidence of defendant, who had to pay the amount claimed for the work. A few more electric light users would "get the wind up" if they only knew the condition of their wiring installations.

A Mouse and a Blow-Out.

The Johannesburg papers for May 13 inform us that a mouse was the cause of a blow-out at the municipal power station, which resulted in the death of two of the employees. Four men were severely burned about the head, face, and arms through the accident. To give the exact words in the report as to the cause of the accident: "It

was due to a mouse coming in contact with the terminals at the premises of Messrs. Leon Bros., Eloff Street Extension. This caused a short circuit, and blew out the switch gear at the power station. The two men who died were R. G. Irwin and J. W. Cleaves; the other two are said to be progressing favourably. When the blow-out occurred, the current was cut-off from the greater part of the city for a considerable time. The municipal electricity system seems to be in a bad way. There is a scheme on the *tapis* for extending the capacity of the power station; but there have been so many interruptions of the supply lately that the citizens think there is not much use increasing the productive capacity if the distribution system is incapable of carrying the current."

Mishaps.

The Potteries Stipendiary at Stoke-on-Trent on the 1st inst. fined the Michelin Tyre Company £25 for neglecting to have a switchboard made dead while work was being done upon it, with the consequence that a workman suffered injury. Another £5 was inflicted as the penalty for failing to notify the accident. It is stated that the case was brought on the instructions of the Director of Public Prosecutions.

COAL AND BYE-PRODUCT EXPORTS.

Despite the coal-marketing schemes, the export coal trade continues to drag along wearily. Business is comparatively small, as are values.

Coal Exports.

In April, the total quantity of coal shipped abroad was 3,722,023 tons, compared with 4,117,515 tons in the same month of 1927, and 4,290,652 tons in that of 1926. The values of these quantities were: April, 1928, £2,936,381; 1927, £3,808,678; 1926, £3,767,909. Gas coal figured in these amounts for the following quantities: April, 1928, 461,814 tons; 1927, 538,739 tons; 1926, 576,276 tons. Of these the values were: 1928, £344,811; 1927, £455,755; 1926, £471,601. In the four months to the end of April, the coal exports totalled 15,745,017 tons; in the corresponding period of 1927, 17,203,162 tons; and in that of 1926, 17,481,236 tons. The values were: 1928, £12,410,876; 1927, £16,541,955; 1926, £15,798,951. The contribution of gas coal to these figures was: In the four months of this year, 2,027,096 tons; in the same period of 1927, 2,279,924 tons; and in that of 1926, 2,324,239 tons. The values of these quantities were: 1928, £1,519,804; 1927, £2,009,122; 1926, £1,895,983.

Gas Coke Shipments.

In April the overseas business in gas coke amounted to 63,941 tons, as against 52,323 tons in April, 1927, and 26,214 tons in April, 1926. The values were: April, 1928, £63,816; 1927, £55,787; 1926, £26,555.

In the four months, 334,642 tons of gas coke were sent abroad, as compared with 246,127 tons in April, 1927, and 362,825 tons in April, 1926. The values were: 1928, £344,959; 1927, £284,370; 1926, £374,518.

Tar Products.

In April, the shipment of benzole had quite a spurt, and amounted to 232,076 gallons. As the total for the four months is only 237,887 gallons, little business was done in the preceding three. The shipment of tar, oil, creosote, &c., amounted to only 123,784 gallons in April, as compared with 8,470,676 gallons in April, 1927. For the four months to the end of April, the shipments were 10,289,361 gallons, as against 14,123,363 gallons in the corresponding period of 1927.

In April, 21,736 tons of pitch were sent overseas, as against 20,316 tons in April, 1927. In the four months, the shipments were 109,434 tons, as compared with 107,752 tons in the same period of 1927.

Sulphate of Ammonia.

The quantity of sulphate of ammonia exported in April was 25,991 tons, as compared with 13,014 tons in April, 1927. In the four months 103,949 tons were dispatched abroad, compared with 49,175 tons in the same period of 1927. Of the total shipped in the four months, Spain and the Canaries took 16,286 tons; Dutch East Indies, 21,460 tons; and Japan, 30,247 tons.

Gas Oil Imports.

During April 11,712,997 gallons of gas oil were delivered, as against 7,756,903 gallons in April, 1927. The total for the four months was 46,561,626, as compared with 44,502,254 gallons in the same period of last year.

FUEL ECONOMY EXHIBITION.

A Permanent Display being Organized.

The subject of fuel economy is one of first importance to a large proportion of British industrial concerns, as the cost of fuel, or of power derived from fuel, represents an appreciable percentage of the cost of production.

From a brochure just published, we learn with interest that a permanent Fuel Economy Exhibition is being organized in London, and will be opened during September next. The aim of the promoters is to collect under one roof exhibits from the leading firms of this country who specialize in the construction of plant or appliances directly connected with the preparation and the utilization of fuel in all its various forms—coal, oil, coke, gas, &c. It is hoped to make the exhibition a Mecca for all those interested in the preparation and industrial use of fuel, so that visitors will have before them the most modern and improved equipment upon the market.

Apart from the fact that the exhibition will be a permanent one, there are other novel features. For example, in order to avoid the considerable expense incurred by firms exhibiting, of keeping their own representatives constantly in attendance, the promoters have arranged to engage engineers specially selected with particular knowledge of the branches of engineering embraced by the exhibition. These engineers will be allocated to classified groups of exhibits, and will furnish impartial information to visitors, and report calls of interested prospective customers to the exhibitors concerned.

The charge for space is moderate and well within the reach of the small firm; and in view of the great national importance of fuel economy, this exhibition comes at an opportune moment. Further particulars can be obtained from the promoters: The Fuel Economy Exhibition, 47, Victoria Street, Westminster, S.W. 1.

THE AMERICAN GAS INDUSTRY AND THE PRESS.

Co-operation Results in Splendid Propaganda.

From Mr. J. H. Hartog, the Sales Manager of the Portland Gas and Coke Company, we have received a copy of the "Sunday Oregonian" for April 22, in which three pages are almost exclusively devoted to articles on gas usage and progress. Mr. Hartog is a believer in co-operating with the Press, with obviously successful results.

Once a year in the United States a week is set aside by the American Gas Association which is given the name of "national gas range week." The purpose is concentration by all gas companies and local dealers on display of the latest gas ranges, so that people may become acquainted with developments which have taken place during the preceding twelve months. In one article in the "Sunday Oregonian," Mr. Hartog discusses these developments. Mentioning colour effects on gas cookers, he suggests that it is a debatable question whether this is going to be a fad or a permanent thing. "Not so long ago," he continues, "our department made it a point to equip all its ranges with an oven heat regulator, except, of course, the inexpensive cookers. It seems just as absurd to expect definite results when using guesswork in baking in an oven as it would be for a carpenter to use a rule or a dressmaker a tape on which all the inch marks had been obliterated. Many women have learned that by depending upon their oven heat regulator they can stir up their ingredients, place them in the oven, and the result is always the same degree of perfection."

Another article deals with the use of gas in hat making. Two cubic feet of town gas, it is stated, are used in the manufacture of a felt hat; and so successful has this form of heat proved that a single American hat company now consumes 7 million c.ft. of gas a year. When the fur has been prepared and blended, and built into a felt form by an elaborate series of processes, it is placed on a block and is ironed by an automatic gas-fired ironing machine which maintains a precise and uniform temperature. The next step is to curl the brim, which is dampened and then shaped with a gas-heated iron. Gas heat dries the printed labels, and is also used in the weaving department, where bands and bindings are made and where controlled heat is essential to the properly finished product.

The use of manufactured gas in industry began about 1900, and between 1919 and 1926 industrial consumption increased about 80 p.ct. At the present time more than one-fourth of the country's yearly production of nearly 500,000 million c.ft. is used for this purpose.

New York State, which leads all other States in the use of manufactured gas, and set a new record of 110,000 million c.ft. last year, consumes approximately 26,000 million c.ft. a year in more than 2000 industrial heating processes.

INSTITUTION OF CIVIL ENGINEERS CONFERENCE.

A GAS SESSION.

In connection with the celebration of the centenary of incorporation by Royal Charter of the Institution of Civil Engineers last week, there was held an engineering conference, one session of which—on Tuesday morning, June 5—was devoted to subjects in which readers of the "JOURNAL" are specially interested. The session was divided into two parts. In the first part, which was presided over by Sir Richard Threlfall, F.R.S. (Chairman of the Fuel Research Board), the matters discussed were "The Utilization of Solid and Liquid Fuels" and "Coke Oven, Town, and Producer Gas;" while the latter portion of the proceedings was devoted to a highly interesting debate on the question of "Waterless Gasholders," which was introduced by Mr. Frank Prentice (Manager and Engineer to the Ipswich Gas Light Company), under the Chairmanship of Mr. Thomas Hardie, M.Inst.C.E. (Chief Engineer to the Gas Light and Coke Company), who presided in the absence of Dr. Charles Carpenter, C.B.E., M.Inst.C.E., who was to have taken the chair.

UTILIZATION OF SOLID AND LIQUID FUELS.

Dr. C. H. LANDER, M.Inst.C.E. (Director of Fuel Research), who introduced this subject, said that, according to present practice and knowledge, coal or other fossil fuel as extracted from the earth had no availability until labour of some kind had been applied to it. Even when it was mined and delivered, its heat units were generally less easy to direct into useful channels than those of gaseous fuels or motor spirits, which were therefore of higher availability. Gas was the fuel of greatest availability, and the fuel which, generally speaking, could be utilized with the highest efficiency. Going down the scale, the light motor spirit and the heavier fuel oils were also fuels of high availability, since they could be turned into gas by methods which were scientifically much simpler than those employed in the case of solid fuels. An important object of the pulverization of solid fuel was to render it more analagous to gas, so that the oxygen necessary for combustion could be brought more rapidly into contact with the molecules of the combustible material. The most important source of fuel in this country, and even in the world, was coal. In its passage from the solid stage to the flue-gas stage, the whole range of products from solid carbon to liquid molecules and gaseous molecules were involved. Modern boiler furnaces could probably extract, and make definite use of, a greater proportion of the initial energy of the coal than could any series of processes involving pre-treatment before final combustion. The justification for such pre-treatment thus required the possibility of monetary savings in other directions. It was impossible to generalize in such circumstances, for the extent to which pre-treatment could be economically applied depended very largely upon local conditions.

COAL MUST BE USED SCIENTIFICALLY.

Prof. HENRY LOUIS (President of the Institution of Mining Engineers) expressed the view that Dr. Lander's statement that coal as extracted from the earth had no availability until labour of some kind had been applied to it was perfectly true as far as it went, but it did not go far enough. In addition to labour, capital and what might be termed administration (technical and scientific work) were required. Any two of these without the third were absolutely useless. A mistake which everybody made was to refer to coal as a single substance, whereas, of course, it was in reality nothing of the kind. Coal was highly complex; and until they got this fact well in mind, and resolved to utilize in the correct way its various constituents, no sound, marked advance would be made in the application of the coal. This country had been a pioneer in the use of coal; and because it was so cheap, people had never troubled to use it scientifically. Things, however, had changed, and it was now necessary to labour strenuously to make up for the time lost. Coal consisted of three substances; and he thought it would be rash to say that no way would be found of separating all these constituents.

APPRECIATION OF THE FUEL RESEARCH BOARD'S REPORTS.

Mr. JOHN H. NARBETH remarked that he hoped it would not be assumed by the people of this country that there was one superlative method of dealing with coal. He would like to say how much he had appreciated the annual reports of the Fuel Research Board. It seemed to him that the money spent by the Government on this Board was some of the best-spent money that the Chancellor of the Exchequer was parting with to-day. He would, however, like to see private enterprise taking a far larger share in the work of development. In one part of his remarks, Dr. Lander had stated that "modern boiler furnaces could probably extract, and make definite use of, a greater proportion of the initial energy of the coal than could any series of processes involving pre-treatment before final combustion." Diesel engines would give 1 H.P. for 0·4 lb. of oil. The best that could be hoped for from a boiler was 0·6 lb. of oil or 0·9 lb. of coal; but the best figures per horse power at present were 0·4 lb. of oil with Diesel engines, 0·8 lb. of oil with boilers, and 1·2 lbs. of coal per horse power with boilers.

SUGGESTED LINES OF FUTURE INVESTIGATION.

Dr. CULLEN urged that the success of many processes would depend upon taking full advantage of local conditions. There could be no one process of pre-treatment for coal in general. He thought Dr. Lander and his Department were possibly giving an undue amount of prominence to the question of low-temperature carbonization; and, as far as coke was concerned, he would throw out the suggestion that perhaps the Board might give a little more attention to that very vital part of the economics of coal.

Mr. THOMAS CLARKSON expressed the view that the subject of pulverized fuel had not received the attention which it merited. He could not help thinking that they were on the eve of great developments in this connection. When pulverized fuel could be offered in a practical form it possessed very substantial advantages.

Mr. R. W. DRON thought that one of the future investigations should be in connection with fusain. Separation might be made in two ways. The froth flotation was one; and the other was the pneumatic system, in which case the very fine dust extracted was almost entirely composed of fusain. It seemed that Dr. Lander and his colleagues might consider what could be done on practical lines with this material, which to some extent was deleterious, but which he believed could be made one of the most valuable constituents of coal, if only they could ascertain how to utilize this value.

Mr. WILLIAM BECKETT referred to experiments being carried out at Hammersmith in the direction of making producer gas from a mixture of coke and limestone—burning them together first, and getting CO_2, and then passing the CO_2 through coke, and converting it to CO. These experiments, he said, were reaching a very interesting stage.

Dr. TOLTZ remarked that he had come from America to see if he could find a commercial process for treating the vast quantities of lignite existing in that country and in Canada. It contained an average of 32 p.ct. of moisture. Two processes of low-temperature carbonization had been tried, but without commercial success. The only possible process he could find in Europe was of drying the lignite first to 15 p.ct. moisture, pulverizing it, and then by means of a process of low-temperature carbonization producing a coke which could be briquetted without a binder. This had been done in the laboratory, but not, he believed, commercially.

DR. LANDER'S REPLY.

Dr. LANDER said he agreed most cordially with Prof. Louis in his statement that coal was not a single substance. The Fuel Research Board had this brought up against them every day in connection with their coal survey, for the purpose of which it had been found essential to take thousands of samples from a seam in its entirety, and to so arrange matters that the laboratory had a complete section of the seam to work from. When mentioning the word "labour," he was simply referring to the fact that coal, as it lay in the face, was of no use to anybody. There was not, and could not be, one superlative method of treating coal in general. At the Fuel Research Station they were not equipped to take processes right through to a commercial stage; and it would not be good policy for a Government Department to do so. Hydrogenation of coal was a very important subject which at present was in its infancy. It was not known what it might bring forth. For instance, one could take a piece of anthracite and by mildly hydrogenating it convert it into metallurgical coke. He might inform them, with reference to remarks which had been made in the discussion, that low-temperature carbonization accounted for not more than 25 p.ct. of the expenditure at the Station, and high-temperature carbonization for above 50 p.ct.

COKE OVEN, TOWN, AND PRODUCER GAS.

Mr. ROBERT RAY introduced this subject. He said that large and modern coking plants were being constructed, and many more were projected; but in every area where such reconstruction was possible one basic factor had to be recognized—namely, that a certain portion of the gas produced by such large batteries of coke ovens must be disposed of at a satisfactory figure. At present the law did not permit of the disposal of crude gas for use beyond the confines of the manufacturing plant, owing to the danger from the impurities contained in it. This was unfortunate, as there were many opportunities—especially in connection with the iron and steel

industries—for disposing of crude gas at a figure which would be remunerative to the coking plant, to the gas-works through which it would be distributed, and to the industrial consumer. He therefore suggested that an endeavour to obtain certain relaxations in the existing stringent regulations relative to crude gas would meet with the approval of all interested parties. Such a development, with the consequent increase in the sale of coke oven gas for town purposes, would benefit all concerned. First, the collieries would have a market for their slack; secondly, the coke ovens could produce coke at a lower figure; thirdly, the iron and steel industries could buy coke more cheaply and, at the same time, would obtain their requirements of cheap gaseous fuel; and, lastly, the gas-works would gain by the greatly increased sale, and thus be enabled to reduce the price of town gas to the domestic consumer.

The Gas Industry.

In the past excellent work had been done by all sections of the gas industry, as distinct from the coking industry. In 110 years of public service the former had gained 9,000,000 consumers, while £116,000,000 had been invested in the industry. Its progress might be appreciated from the fact that between 1882 and 1926 the average annual increase in sales was 3618 million c.ft., while between 1913 and 1926 that figure rose to 5892 million c.ft. Progress in the development of plant had been equally striking, largely due to the foresight of those who recognized the value of research, and expended the necessary money wisely. Although it was obviously difficult to generalize, the modern gas plant could at present produce gas at 7½d. per 1000 c.ft., including all retort-house charges. Though the use of gas had greatly increased within recent years, there was a vast market in industry, the fringe of which had only just been tapped. He suggested that the gas salesmen of the future would have to be of a different calibre from the men who, in the past, had done so much to advertise the benefits of gas to domestic consumers. In selling gas to the industrialist, the salesman must not only be an expert in salesmanship, but must also be fully qualified to discuss the theory and practice of the proper utilization of industrial gas with the engineers and manufacturers with whom he might come in contact. Finally, he appealed to all those engaged in the manufacture and sale of gas, from whatever source, to realize the opportunities which the industrial market offered, and to effect such changes as would enable them to supply the manufacturer at a reasonable price with the product he required.

A Plea for Greater Co-Ordination.

Dr. E. W. Smith said he would like to draw the attention of the meeting to the fact, of which Mr. Ray was doubtless fully aware, that there was not really a large amount of suitable coke oven gas available at the present time in this country—if one bore in mind that certain very rigid conditions had to be complied with as regards quality, pressure, consistency of supply, and so on, for the gas industry. Of course, the gas industry, on the other hand, ought to be prepared to look at matters nationally; and if there were pits where coking could very well be adopted, then the gas industry, or the gas undertakings in those areas, should be willing at any rate to explore thoroughly the possibilities of using coke oven gas from plants which it was expected would be built. New plants could supply entirely satisfactory gas for town supply, and give all the guarantees the gas industry rightly demanded; and he thought this was not an unsuitable occasion on which to emphasize the fact that it would be an excellent thing if much greater co-ordination of a national kind existed between the gas industry and other fuel users and producers—even if it went so far as the formation of suitably adapted Gas Commissioners, who would have the right to explore thoroughly such problems as the utilization of coke oven gas for town purposes, taking over the smaller undertakings and incorporating them with larger ones, inter-working of undertakings, and so on, on the lines of the Electricity Commissioners, but, of course, adapted primarily to the needs of the gas industry. He was quite sure that something would have to be done in this direction for the gas industry, which was a national industry giving service to the country which was unexcelled by any other of the larger industries. Its service was excellent in every way; but it was possible that the industry had within its power to perform still further national service by agreeing to closer co-ordination with other industries, and no one could blame Mr. Ray for frequently bringing this matter forward. It could be realized that an outlet for gas from the coke oven industry would mean cheaper coke. Cheaper coke would mean cheaper steel, and thus one of the basic industries of this country would be helped at any rate to be put on its feet again. He thought, therefore, that Mr. Ray was to be congratulated upon having introduced this subject.

Coke Ovens and Iron and Steel Making.

Prof. Henry Louis said he was going to venture to submit an entirely different point of view from that of Mr. Ray. Mr. Ray, as he understood him, urged that surplus coke oven gas should be utilized for town supplies. He (the speaker) took the opposite standpoint, and said that there ought to be no surplus coke oven gas. He looked upon the coke oven industry in this country as existing for iron and steel making. If the coke ovens were situated at the iron works, and the steel works were at the iron works, one could easily utilize the coke oven gas—especially as mixtures of coke oven gas and blast furnace gas made admirable fuel for gas engines. In this way, one could make use of every cubic foot of gas to the best possible advantage in producing good and cheap steel. What was as urgently wanted in this country as anything else was cheap steel. There were, of course, a few independent coke oven plants that were able to secure a market, and there was no reason why they should not utilize their gas in the way Mr. Ray had pointed out; but looking at the coke oven industry as an auxiliary to the iron and steel industry, the other was the correct use for coke oven gas.

Prof. W. A. Bone supported strongly the remarks of Prof. Louis, and expressed the view that it would be the greatest possible misfortune to this country if coke oven gas were converted into public gas supplies, instead of being utilized in the steel works. The proper place for the carbonization of coal for blast furnace coke was at the iron and steel works, and not at the colliery. It was only by this means that they could produce finished steel sections with the lowest fuel consumption, and thus successfully compete with those countries where already this economy had been achieved. He would regard any diversion from that policy as disastrous from a national point of view.

Mr. Ray's Reply.

Mr. Ray agreed that there was at the moment but a comparatively small quantity of coke oven gas available for either town or industrial purposes. In view, however, of the depressed condition of several of the basic industries of the country—such as coal, iron, and steel—it had become imperative to follow for once the lead of foreign countries in the direction of centralizing the coking industry. In doing this, they would be faced with the difficulty of disposing of what had become known as "surplus gas." To-day in this country the process of re-organization was proceeding rapidly—especially in those areas where the gas referred to could easily be absorbed. As this re-organization progressed, the difficulty of disposing of the gas would increase. In fact, this was the one consideration which tended to hold up the movement at the moment. In order to aid the coking industry, it was essential that the great gas producing industries of the country should come together round the council table and consider what could best be done. He agreed that to attempt to interfere with the domestic gas supply would be sheer impertinence on the part of the coking industry. At the same time, as those who lived in the industrial areas knew, there was a vast untapped market for gas existing—a market which was only waiting for that gas at the right figure. In the Sheffield area, for instance, great progress had been made by far-seeing people in control of gas undertakings.

Crude Coke Oven Gas for Industry.

Gas was sold at a comparatively low figure for industrial purposes, but that low figure was still too high for certain large industries; and in this connection he made a suggestion that crude coke oven gas, which was now streaming into Sheffield in huge quantities daily, could be tapped from the mains for the benefit of those industries, and at a price which would suit them, if certain regulations which prevented them from utilizing crude gas in this way at the moment were either modified or entirely done away with. It was, of course, unfortunate that in this country in the past coking plants had been erected at the pithead rather than at the iron and steel works; but if, again, he took as an example the Sheffield area, around which there were spread all sorts and sizes of coke oven plants, this crude gas could be tapped in the mains on its way to the gas undertaking by the steel works, with great benefit to these users. Of course they, as coke oven gas producers, could not sell their gas except through the gas-works, under statutory obligations; and they did not wish to do so. There was no question that the iron and steel industries, which were to-day labouring under great difficulties owing to the distribution of their plants, would be only too glad to obtain a continuous flow of crude coke oven gas at the right price. Industrial gas to his mind was made too dear because it had to bear its share of the distribution costs of domestic gas; and he would suggest that, where an industrial gas grid formed in any area—and the possibility had been discussed many times—that grid should bear only its own distribution costs. Another point to which he drew attention was the use of coke oven gas for generating electricity. The Company which he represented had done a great deal of successful work in this direction. Figures which he had prepared with regard to a gas engine over a period of eight years' continuous running (barring strikes) showed a cost of production of 0·3d. per unit; and with a modern engine installed two years ago (the maintenance bill on which he admitted had so far been very small) the figure was just over 0·2d. per unit.

WATERLESS GASHOLDERS.

Mr. Frank Prentice, of Ipswich, who introduced this subject, began by remarking that a waterless gasholder was more than a mere structure; it was an accurately designed machine. The absence of a tank reduced the weight of the whole struc-

ture to one-twentieth, and in the case of large holders to one-sixtieth, the total weight of a tank holder of similar capacity. The holder erected at Ipswich last year weighed 800 tons, and was carried on a ring foundation of reinforced concrete 6 ft. deep and about 2 ft. wide, slightly widened at the uprights, and splayed to a width of about 5 ft. at the base. The weight to be carried was about 1 ton per sq. ft. The saving in the cost of foundations was evident, since the total weight of a tank holder of the same capacity would be about 18,000 tons. To construct a rigid cylinder 254 ft. in diameter and 337 ft. high, with a piston so accurately fitted as to obviate leakage at any elevation, working easily inside it, was no small engineering achievement. One of these holders erected at Tampa (Florida) was subjected to a severe typhoon, with a wind-velocity exceeding 120 miles an hour; and while its wired glass windows 2 ft. square were shattered by wind-pressure, no distortion of the cylinder shell was observed.

In his short communication Mr. Prentice gave further details of the holder, and an account of the method of erection. It may be remarked here that illustrations and particulars of the Ipswich holder to which he referred will be found in the Presidential Address which he delivered to the Eastern Counties Gas Managers' Association (see "JOURNAL" for May 11, 1927), and also in the report of the inauguration ceremony which appeared in the "JOURNAL" dated Oct. 5, 1927.

ADVANTAGES.

In conclusion, Mr. Prentice summarized the advantages of the waterless holder as follows:

1. As there are no lutes to cup and uncup, the pressure remains constant; and this pressure can be varied within limits to suit individual requirements, between (say) 4 and 20 in. of water pressure.
2. For ground liable to subsidence, such as is experienced in mining areas, these holders are especially suitable, as they can easily be uprighted should occasion demand. In the case of one holder of 10 million c.ft. capacity in the Ruhr district, which is especially liable to subsidence, jack-cavities form a permanent part of the structure.
3. The costly operation of painting the gasholders each year is no longer necessary; a coat of paint once in five or six years being sufficient to keep them in good condition.
4. Owing to their light weight they can easily be erected 10 to 15 ft. above ground-level, thus providing a large covered store. This is a regular practice where space is limited.
5. In cold climates, where severe and continued frosts are experienced, the absence of water in lutes and tanks minimizes all difficulties arising from low temperatures.
6. The light weight of these holders.

A CENTURY OF IMPROVEMENTS.

Mr. T. HARDIE (who was in the chair) said that credit was due to the German engineer Herr Konrad Jagschitz, who conceived the idea of this holder some thirteen years ago. Up to the introduction of the waterless holder, he thought British gas engineers had been responsible for all the important improvements that had been made to gasholders during the last hundred years. There were the extension to the telescopic system; the flying lift, the best example of which was Livesey's holder at East Greenwich; the simplification of guide-framing; Pease's system of wire ropes to support the floating bell; and the development which had been most popular in recent years—the spiral system of Gadd, in which guide-framing separate from the holder itself had been completely eliminated, and the stresses thrown on to the tank walls. All these developments indicated that there had been a good deal of skill and thought devoted in this country to gasholder construction; and certainly they had effected very considerable reductions in construction costs. The inventors, however, seemed to have accepted two principles as being almost essential—the telescopic system and the water seal—and these had rather limited the scope of their improvements. Herr Jagschitz's ingenuity was shown by the fact that he had departed from these two principles; and certainly his engineering ability was exhibited in the design of the shell which formed the holder. The method of sealing the piston was both ingenious and effective; but he did not think it could be considered final. Though the tar seal was a vital item in the present design of the waterless holder, as an engineer he certainly regarded the construction of the holder itself—whereby they got a structure of which they could accurately determine the stresses, and provide for them—as the great improvement that had been brought about. In the case of the floating bell types, they had a structure in unstable equilibrium. He believed it was Cripps who had pointed out that the centre of gravity was above the centre of buoyancy, with the result that under the slightest wind pressure the holder had to be supported. It was supported by the guide framing in the ordinary style; and the design of that kind of holder was based upon the stresses being taken on the columns opposite to the direction of the wind. But it was quite impossible, he thought, for any one of them to say exactly over which columns these stresses would be distributed. With the waterless holder they had overcome this difficulty, and had got a structure rigid and static.

A HUGE CANTILEVER.

It consisted of a number of columns strongly tied together on the top by steel bracing, and connected to each other with solid steel plates, flanged to give stiffness and take local wind pressures and distribute them to the standards. The whole formed a huge cantilever, in which the length of the arm was the height of the holder, and the section was a polygon the diameter of the shell. The stresses of the roof, side sheets, &c., were all taken by these vertical stays; and those, together with the stresses due to the action of the cantilever itself, could all be accurately determined. Thus they arrived at a structure with which they could be sure, in putting it up, of what results they were going to obtain. That was, in his view, the position with regard to this holder; and he was very pleased that Mr. Prentice had seen fit to bring forward the subject that day. It had given him (the speaker) much satisfaction to see, in an engineering works in the north, that they had installed the elaborate machines necessary for the purpose of producing these holders in this country as cheaply and economically as they could be produced anywhere.

THE QUESTION OF ATTENTION.

Mr. R. J. MILBOURNE said that he first of all desired to congratulate Mr. Prentice upon the courage he had shown in departing from English standard gasholder practice—especially as this new type of holder could not possibly be left to perform its functions with the same amount of inattention as was usually the lot of the standard-framed holder, which an experience of over a century had proved could be trusted to look after itself, and only needed watchful supervision at long intervals. The waterless gasholder was undoubtedly a machine in the strictest sense of the word, and therefore must receive constant attention and inspection, to ensure that the disc was moving in correct alignment, and that the tar seal and pumps were functioning properly. He understood that all the waterless holders erected in America had provision made for the daily supervision and inspection of the tar seal, radial guides, rollers, &c. It would be instructive to know whether similar arrangements had been made at Ipswich—and, if so, the number of men engaged in such work—as any extra expenditure of this nature should be placed against the saving in the initial cost. The saving effected in the weight of waterless holders over the standard-guided ones was to a considerable extent counterbalanced by the extra cost and labour involved in the fabrication and erection of such an accurately fitted machine.

RESISTANCE TO WIND PRESSURE.

He disagreed with a statement made by Mr. Prentice that the polygonal form of cylinder was either as rigid or as strong as one of circular construction, or that the straight plate could be introduced without any necessity for external stiffening. Surely the channel section, which was formed and pressed on the upper edge of the mantle plate, was primarily intended, and did act, as a stiffener. Further, did not the channel uprights, with their strong flange plates, to which the side mantle plates were riveted on their vertical edges, and the horizontal balconies and platforms, really form external stiffeners, which were absolutely necessary to resist wind pressure? It would be interesting to learn whether the effect of the severe typhoon on the Tampa gasholder was noted and recorded scientifically at the site. He did not know what was the height of this holder; but it was difficult to imagine that it could withstand a wind pressure equal to about 71 lbs. per sq. ft., if computed according to American practice, without showing some deflection from the vertical. One might expect that even a waterless gasholder would behave as an elastic structure under such severe pressure; and it was probable that the glass windows were broken more by the deflection of the cylinder than the force of the gale. As it was stated that the glass windows were shattered by this gale, was there any trouble caused to the working of the disc by splintered glass falling into the tar seal?

FURTHER QUESTIONS.

As the electrically-driven pumps were normally only at work at "rare intervals," was there not a danger of these failing to act when required; and was it therefore usual to give the pumps a daily run, to see that they were always in working order? It was probable that the cold weather might alter the viscosity of the tar, and cause it to become sluggish; while the hot weather might cause it to become thin, and keep the pumps continuously in use.

Was it necessary to renew the tar or re-condition it in any way? As the tar seal was held in position by a cloth fabric, it would be interesting to know what was the length of service this material was likely to give when carrying a load of 10 or 20 in. of pressure, and also whether there was any known sign or indication which would serve as a warning to show that the cloth fabric required renewing before it eventually gave way and allowed gas to escape above the disc. The pressure on the foundation of the Ipswich holder was given as 20 cwt. per sq. ft. This, he assumed, was the dead-weight of the structure, and did not allow for wind pressure which would be transmitted, and would have to be taken up by the foundation.

With regard to painting, it would appear that there was no saving under this head, as the actual external surface to be covered in the tankless holder was nearly 10 p.ct. more than the entire surface of a spirally-guided holder and steel tank of equal capacity, due to the fact that the flanged channels on the mantle plates and the balconies must, of course, be painted. There was no doubt that the most serious objection to waterless gasholders was the danger of gas escaping above the disc and forming a highly explosive mixture, which (if from any cause it became ignited) would cause damage and destruction to life and property far in excess of anything they had hitherto experienced with the standard type of holder. With the latter style, the entire structure being open to the atmosphere, there was not the slightest chance of an explosion occurring, as the gas would be dissipated into the atmosphere, and not pass into a closed cylinder. In conclusion, he thought mention should be made of the spherical form of gasholder, which was not only waterless, but possessed the advantage of having no moving parts. He was now engaged in going closely into this type of holder; but time would not permit him to say more about it that morning. The fact should, however, be mentioned at this Centenary Conference, so as to place on record the "state of the art" at the present day.

GLANCING BACKWARD.

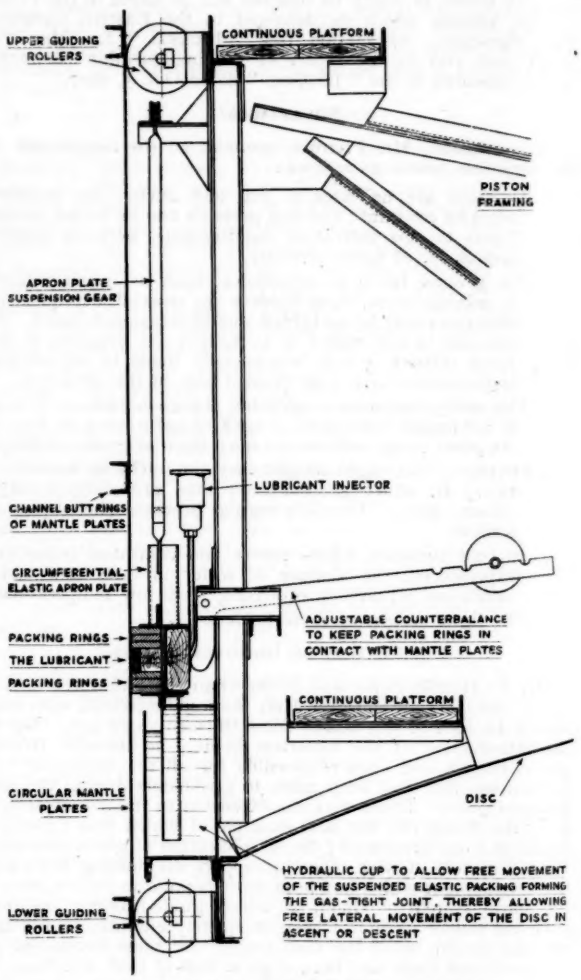
Mr. SAMUEL CUTLER remarked that from an historical point of view it should be realized that tankless or waterless gasholders had taken about eighteen years to secure recognition in this country. It was, he thought, in 1910 that he attended the Dutch Gas Engineers' annual meeting, in Brussels, under the Presidency of the late Mr. J. Van Rossum du Chattel, who in his address described the invention of a gasholder without any water seal, for which the firm of Aug. Klonne, in Dortmund, took out a German patent in 1908. Thus nearly two decades had passed before, as far as this country was concerned, they had been considered in any practical form. Of course, one knew the extent of their adoption in Germany and America—due in the main to the considerable economy in their first cost of construction over and above the ordinary guide-framed gasholder. Now, since spiral gasholders—which did not exist in Germany or America—were anything from 15 to 20 p.ct. cheaper than a guide-framed gasholder, the saving in first cost and capital outlay was attractive for those countries where spiral holders were not favoured. But one could not disguise the fact that the waterless holder was handicapped to a considerable extent, as far as first cost was concerned, as compared with the spiral holder. At first sight, to even a practical mechanical engineer, the spiral system seemed open to criticism; but if one would consider it as a screw operating within a nut—the nut being sufficiently secured to a base—it was obvious that, for guiding a structure such as a gasholder, it was a very efficient construction. That spiral holders had proved themselves to be reliable structures, immune from accidents, breakdowns, and explosions, was proved by their general and continued adoption.

STRUCTURE OR MACHINE.

It was not desirable for a gasholder to be changed from a "structure" to a "machine;" but these words rather aptly summarized the position. The "structure" functioned practically without attendance; the "machine" required attendance and the use of electric current, without which it could not function. Apart from foundation difficulties—which, after all, were the exception, and not the rule—the water-filled tank provided a desirable base and anchorage for a gasholder. The load on a water-tank gasholder foundation seldom exceeded 1 ton per super foot, which was a very moderate loading for most locations in this country; and a reinforced concrete raft 6 to 9 in. thick was usually all the foundation necessary. Was the fixity of this colossal structure any advantage? Some were certain in course of time to become "leaning towers of Pisa." While the gasholder shell remained perfectly upright, the centre of gravity would not be disturbed by the weight of the disc; but any inclination due to subsidence of foundations must necessarily upset all the calculations in this respect. Take the Ipswich gasholder, for instance. With a disc weighing 125 tons, and a loading of 185 tons to bring it up to a pressure of (say) 10 in.—which was 1 in. less even than that given by the ordinary spiral holder of comparative capacity—one had a total weight of 310 tons contained in a flat disc at the very top of the structure, let alone the weight of the roof, all tending to increase its inclination. With regard to painting, the easy lowering of an ordinary gasholder provided facilities for painting and observation of its condition that were obviously an advantage. A polygonal piston with numerous corners was not ideal, either for tightness or for smooth working; and, if he was correctly informed, the mishap that recently occurred to a gasholder of this type in Toronto was attributable to the displacement of a filling-in at one of these corners. This method of erection was obviously a suitable one, but was not novel. They had for many years erected guide frames from the crown of the air-inflated gasholder.

THE TAR SEAL.

The tar seal was really, to most engineers' minds, the crucial point of the Ipswich type of waterless gasholder; and with only one holder of this kind actually at work in this country, the test of experience under ordinary year-in-year-out gas-works conditions could not yet be claimed to be available. The safe working of the holder admittedly depended upon the maintenance of the tar seal, and this again also admittedly depended upon the pumps coming into action at the right time, and upon the disc keeping level at all parts of its travel, as well as in some lesser degree upon the character of the tar. One heard of the danger that might arise from freezing of condensed vapour on the walls of the tower when the disc was not at full travel—a condition that must often occur during winter—and of possible derangement if the condensed water diluted the tar in the seals; and although in large works with an organized staff these matters might receive due attention, they would be an additional anxiety to many an already over-burdened manager, who might well inquire whether the tar-luted waterless gasholder had advantages over-riding these risks. The consumption of electric current by the pumps was no doubt small and negligible, as Mr. Prentice had stated; but their functions


UPPER GUIDING ROLLERS
CONTINUOUS PLATFORM
PISTON FRAMING
APRON PLATE SUSPENSION GEAR
LUBRICANT INJECTOR
CHANNEL BUTT RINGS OF MANTLE PLATES
CIRCUMFERENTIAL ELASTIC APRON PLATE
ADJUSTABLE COUNTERBALANCE TO KEEP PACKING RINGS IN CONTACT WITH MANTLE PLATES
PACKING RINGS
THE LUBRICANT
PACKING RINGS
CONTINUOUS PLATFORM
CIRCULAR MANTLE PLATES
DISC
HYDRAULIC CUP TO ALLOW FREE MOVEMENT OF THE SUSPENDED ELASTIC PACKING FORMING THE GAS-TIGHT JOINT, THEREBY ALLOWING FREE LATERAL MOVEMENT OF THE DISC IN ASCENT OR DESCENT
LOWER GUIDING ROLLERS

Section of Klonne Waterless Gasholder.

[Referred to by Mr. Samuel Cutler in his remarks during the discussion on Waterless Gasholders at the Conference of the Institution of Civil Engineers.]

were anything but negligible, and this seemed to be the more important point.

ANOTHER FORM OF CONSTRUCTION.

The few remarks he had made would be regarded as criticisms of the design before the meeting; and inasmuch as the gas industry was no doubt open to consider any improvements in waterless gasholders, it would not be out of place to suggest to those present another form of construction, which it could be claimed was a step in the direction of obviating the attendance on moving machinery and the tar seal. He had mentioned before that in 1910 Messrs. Klonne were interested in tankless gasholders; and they had now designed, and had working or in course of construction in Germany, eight gasholders of an entirely new type. Their holder was circular in form, and had a dry seal, which obviated all attention, and more closely conformed, in his opinion, to the functions of an ordinary gasholder. For English practice, where nine out of ten new gasholders were spirals, the cost of the waterless holder should be compared with that of the spiral; and on this basis there appeared but little saving in capital cost, excepting for holders

of the largest dimensions. On the other hand, the cost of tar pumping and constant supervision were continuing expenses. If, however, as seemed probable, the tar seal could be satisfactorily replaced by some more stable form of sliding joint, cutting-out the need for pumps and continuous supervision, the waterless holder would assume a more favourable aspect, both in regard to cost and safety. In short, he ventured to express the opinion that waterless gasholders of the Ipswich tar-sealed piston type were likely to be but a passing phase of gasholder construction, leading either to a safer form of waterless construction or to a reversion to the present standard types.

Advantages Claimed Not to be Lightly Disregarded.

Mr. W. Doig Gibb, who was next called upon, said he happened to be Chairman of the Gasholder Construction and Deterioration Committee of The Institution of Gas Engineers; but in a word or two he could say that he was very much interested in this new design. Whether it was to be a permanent design, or whether it was a design which would be further improved, he did certainly think that the claims in its favour which had been enumerated by Mr. Prentice could not be lightly disregarded. It was all very well to put aside in a light fashion the cost of foundations; but the fact remained that, in the case of a spiral holder in a steel tank, in which he had been interested lately, there were over 1000 piles put into the ground to carry a similar disc foundation as would only be needed in connection with a waterless holder, and that these piles were required to carry a weight of 28,000 tons of water. That was a 3 million c.ft. holder. Now, it was absurd to dismiss lightly the foundation cost which was involved in a circumference of some 180 ft. to carry such a weight.

Question of Appearance.

To turn to another aspect of the matter, he did not suggest that they as gas engineers contended seriously that any form of gasholder was a thing of beauty; but if there was anything in the argument that a variation in scenery was of advantage, then it must be admitted that in the case of the waterless holder they had not that variation in scenery that was obtained with a spiral or guide-framed holder, which changed in appearance from time to time. Personally he was not only very much interested in this type of holder, but he was inclined to think that this or some similar design had come to stay. Obviously, there was some room for general education on the matter, when he told them that a few days previously, when passing on the top of an omnibus the Woodford gasholder which Mr. Hardie was constructing for the Gas Light and Coke Company, he overheard one man inform another (though at the time they were in Essex) that "this was a new ventilating shaft for the Kent coalfield." [Laughter.]

Foundations.

Mr. George Evetts remarked that Mr. Prentice had told them that the Ipswich holder weighed 800 tons, and then he went on to say that the total weight of a tank holder of the same capacity would be about 18,000 tons.

Mr. Prentice: Including the water and the tank.

Mr. Evetts said he would like Mr. Prentice to tell them what would be the weight of the holder and steel tank out of the 18,000 tons. This information would enable them to get a right perspective of the respective weights. The cheapness of foundations had been mentioned; but he had been responsible for the design and construction of nearly twenty gasholders, with their foundations, in the last ten years, and he could say that there was not one of these cases in which he would have saved 10s. had he put in a waterless holder. In the case of a good site, the foundation of a waterless holder could cost nothing less than for an ordinary holder. In the case of a bad foundation, he was prepared to admit that there would be a considerable saving. Mr. Cutler had mentioned a spiral holder as being 15 to 20 p.ct. cheaper than an ordinary holder; but his own experience was that it ran out at from 8 to 12 p.ct. cheaper than a guide-framed holder of the same type.

Waterless Holders Should be as Successful in this Country as Elsewhere.

Mr. J. L. Chaloner said he was not a gas engineer, but had been privileged to be associated to a certain extent with the introduction of the waterless gasholder into this country. Conditions in this country did not vitally differ from those in Germany and America; and the waterless holder should be equally successful here as elsewhere. He remembered reading the remarks of Mr. Milbourne in the discussion on the paper contributed by M. L. Rolland d'Estape to the proceedings of The Institution of Gas Engineers in 1925. These remarks were really a testimonial to the waterless holder; and he was rather surprised to find that within so short a time Mr. Milbourne had discovered so many faults in this type of construction. There might be reasons for that; but this was neither the time nor place to go into the matter. Gas engineers he had met had given fair hearing to the claims of this holder. The gas engineer in this country was conservative when necessary; but he was decidedly progressive when it seemed to him advisable.

Mr. Prentice's Reply.

Mr. Prentice said the discussion had interested him very much, and in some ways it had even amused him. Mr. Milbourne had emphasized the advantages of the ordinary holder in the matter of the amount of attention required. Well, the ordinary holders of which he (the speaker) had had charge in the last forty years at Ipswich had received a very great deal of attention. Were not half the troubles they had heard of recently in connection with gasholders due to inattention? In his judgment—particularly in relation to late experiences—this was one of the things which the holders should have had, and had not had. He was sorry to say that he could not satisfy Mr. Milbourne's curiosity with regard to the Tampa holder. As to the suggested danger of the electric pumps giving out, he had had not quite a year's experience, but so far the pumps had not given out. To make things quite safe in case of accident, each of the pumps was in duplicate; but events seemed to show that they might just as well have had five pumps as ten. He would candidly admit that the question of the sealing tar had greatly exercised his mind; but as the results of months of work and many experiments, in which he had had much help from his juniors, they had now obtained what they thought to be a perfect sealing tar, which was very easily produced. So far as their experience went, it was absolutely static. It was impossible for him so say how long the canvas strip would last, for it had never been renewed.

Some Figures of Costs.

There was a great deal in the question of painting. An ordinary holder such as they had at Ipswich required to be painted at least once in two years; and as a holder the size of their waterless holder would cost £200 to paint, they must put the charge at £100 a year, if the holder was properly looked after. The waterless holder would also need painting, and would cost £200; but one only painted it once in five years, so that the expense was £40 a year. He had always been careful about inspecting his ordinary holders and carrying out little necessary jobs; and he would put the cost of this at £15 to £20 a year. Oil on surface of water would cost from £8 to £10. Thus they might reckon, with the £100 for half cost of painting, to which he had already alluded, a total cost per annum of (say) £123 for an ordinary holder of 2 million c.ft. capacity. Now for the waterless holder. In this case he put the running costs at: Painting, £40 a year; inspection £35; and electricity roughly £10. Thus he arrived at a total of £85 per annum for the waterless holder, as compared with £123 for the ordinary type. As to the inspection cost, he could give all the details if desired. The figure he had mentioned was what he was now paying; but he intended to reduce it very shortly. With a new thing, however, one did not run any risks; and this holder was examined every day, with a full inspection once a week. He would go very much further, and say that if—instead of the figures being £85 per annum for the waterless holder, as against £123 for the ordinary holder—the waterless holder cost twice as much as the ordinary holder, it would be well worth it, because its advantages were so great. Mr. Milbourne talked about an explosion of gas if it got above the disc. If, of course, one carefully arranged that some gas should escape, and if one made the proportion right and applied a light, there would be an explosion, and a very bad one; but these conditions could not arise in practice.

Further Queries Answered.

Replying to Mr. Cutler, and his objection to the holder because it was a machine, Mr. Prentice said it seemed to him that because it was a machine it was much more likely to be accurate and reliable than a thing which was not a machine. Mr. Cutler had talked about these waterless holders becoming "leaning towers of Pisa;" but he (Mr. Prentice) had heard of tank holders becoming "leaning towers of Pisa." There was one not 12 miles from Ipswich. Thus the term was applicable not only to the waterless type, but to other types. In reply to Mr. Evetts, he said the figure he had asked for could easily be worked out. With regard to foundations, in many places, even Ipswich, these were a very serious consideration. His vertical retort house was built on piles; the works were near the docks; and a little way below the surface one encountered mud. If he had had to erect a tank holder, he would have had to pile at enormous expense; but as he had had only 800 tons to deal with in the case of the waterless holder, instead of the 18,000 tons which would be the weight of a tank holder, including water, that was not necessary. This was one of the reasons why he had been attracted to this type of holder. No one had drawn attention to the primary advantage of these holders—namely, constant pressure. The peak load which came on when a lot of cooking was being done was very difficult to meet. A few days ago, at a small works which he visited, an elaborate boosting system was being installed to meet this load. With the waterless holder, whether it contained little or much gas, the pressure was always maintained. Previously he had employed about six men constantly attending to what were called "bad supplies"—though, of course, very few were really bad supplies—but this was not necessary now. Another advantage was that there was no need to pump syphons, because there was nothing to pump out of them. With the experience he had had, he was satisfied that the holder constituted a great advance on anything yet on the market.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Visit to Tunbridge Wells.

The Annual Summer Meeting of the London Juniors took the form of a visit to the works of the Tunbridge Wells Gas Company on June 9. Members and lady friends assembled at the showrooms of the Company, which are situated in High Street, and after inspecting these ideally-situated and well-equipped premises, were conveyed to the works, where they were able to see how Mr. Leonard J. Langford, the Engineer, satisfies the first essential of good service—the manufacture of gas of constant quality at an economic price.

The carbonizing plant consists of regenerative horizontals, machine stoked and discharged. The retorts are arranged in two settings, both in the same house; and as the coke is discharged from the retort, it is directed by a coke bus on to endless push-plate conveyors, one to each section. The conveyors converge at the middle of the house, and discharge the coke through the floor into an inclined conveyor at right angles. The coke is then conveyed outside the retort house to a hopper in the coke yard, having been quenched *en route*. All further transport is effected by skip, which travels on a telpher track running across and over the house to a coke cutting and grading plant and a carburetted water gas plant on one side, and to coke and coal storage yard on the other.

MOISTURE AND NAPHTHALENE EXTRACTION.

The members were keenly interested in the moisture and naphthalene extraction plant. A rotary washer for these processes is installed on the inlet main to the gasholders. Through the first half of the machine is circulated a 40 p.ct. solution of calcium chloride, which absorbs moisture from the gas, reducing its dew-point below that at which deposition of water can take place in the district mains and services. As this absorption is accompanied by the generation of heat, the solution is passed through a cooler, consisting of a rack of tubes over which water from the bottom of the gasholder tank is pumped. The moisture taken up by the calcium chloride is driven off by heat. For this purpose the exhaust steam from the engine driving the washer is utilized to heat a small rack of cast-iron tubes over which the calcium chloride flows. In order to prevent re-absorption of moisture by the dried gas, the water in the gasholder tanks and cups is covered by a film of oil.

In the second half of the washer the gas is made to pass through oil, which extracts the naphthalene from it; and this oil, when used, is vaporized in the carburetted water gas plant.

The carburetted water gas plant, erected in 1900 and remodelled in 1920, has a capacity of approximately 1 million c.ft. a day, and the question of installing a waste-heat boiler in connection with the plant is at present under consideration. Remodelled six years ago, the ammonium sulphate plant has a daily output of three tons of salt. Tar is treated in a Wilton dehydration plant of a capacity of 20 tons per day.

COKE CUTTING AND GRADING PLANT.

For many years the Company have supplied broken coke, but owing to a rapid development in the use of coke as an economic fuel for domestic and other purposes—particularly that of hot water circulators—new plant has just been installed which breaks the coke, and grades it uniformly in various sizes to suit any particular requirement.

The coke is fed by telpher into a hopper over the plant. It is then passed through a cutter; the broken coke falling on to inclined jigging screens. The first screen provides for the removal of coke breeze, which is collected in its hopper below. The second deals with small coke, the third with medium, and the last with large; each size having its receiving hopper. For large coke, the cutter is by-passed. The hoppers being overhead, quick loading of railway wagons and bags is secured by means of chutes with sliding doors.

The whole of the ashes from the retort house, boiler houses, and water gas plant, after being screened, are put through a "Columbus" coke separator.

Approximately 37 p.ct. of coke and 38 p.ct. of clinker are recovered from the ashes; the recovered coke being used under steam boilers, and the clinker and ashes being sold.

LUNCHEON.

Subsequently the visitors were conveyed to the Pump Room, where they were the guests at luncheon of the Chairman and Directors of the Tunbridge Wells Gas Company. Mr. HAROLD A. BEECHING (the Chairman) presided; and supporting him were Mr. Harold Thorpe, J.P. (the Deputy-Chairman), Mr. Langford, and Mr. Charles F. Catt, F.C.I.S. (the Secretary).

After the Loyal Toast had been honoured,

Mr. BEECHING welcomed the Association to Tunbridge Wells, and said that their visit to the Company's works that morning would have enabled them to appreciate that the Company were endeavouring—and, he thought, successfully—to keep abreast of the times. Meetings of this nature, observed Mr. Beeching, offered golden opportunities for the younger members of the gas profession to equip themselves for the future. Gas had a worthy past, was enjoying a prosperous present, and would, without doubt, have a splendid future. He fully realized, of course, that competition would become keener; but this competition could be met if the Juniors of the industry were imbued —as he was sure they were—with the right spirit. He coupled with the toast of the "London and Southern District Gas Association" the names of their President, Mr. Leonard Lacey, and their Hon. Secretary, Mr. Arthur Tennant.

Mr. LACEY expressed the gratitude of the Association, and his own personal thanks, for the cordial welcome. Then Mr. W. T. KENSHOLE, of Lea Bridge, proposed, and Mr. F. A. FROST, of the South Metropolitan Gas Company seconded, a vote of thanks to the Chairman and Directors of the Company, and to Mr. Langford and Mr. Catt, for their hospitality; and Mr. LANGFORD and Mr. CATT briefly replied.

NEW DEVELOPMENTS IN GAS-WORKS CARBONIZING PLANT, WITH SPECIAL REFERENCE TO REFRACTORY MATERIALS.

By G M. GILL.

[A Paper presented to the Refractory Materials Section of the Ceramic Society.]

A steady change has been taking place in the system of carbonizing plant adopted in gas-works. The changes already made in England have not yet been many in number. In all such developments the early stage is a comparatively slow one; but when once the new systems become proved successes, their adoption in more or less large numbers is likely to take place. This is the position in England at the present time. Developments in the carbonizing plant of other countries are also a good indication of the changes which are likely to take place in England. It may therefore be useful to make brief mention of these developments in the three countries which are prominent in the coal carbonizing industries.

FOREIGN DEVELOPMENTS.

In the United States, full-sized coke ovens and smaller horizontal ovens of various sizes are very largely used in gas-works, and this tendency is growing. It would seem as though a very large part of the coal carbonized in their gas-works will be used in horizontal ovens varying in sizes from charges of 1 to 12 tons for carbonizing periods of 12 hours and upwards. Continuous vertical retorts are used in a number of works; and this tendency is growing, as existing installations have done very well. Intermittent vertical ovens of a modified German design have been installed in a few gas-works; and these show every sign of increasing. Horizontal retort settings are still used in a considerable number of works; but their number will undoubtedly decrease substantially in the future.

In Germany, and to a smaller extent in France, Belgium, and Holland, there has been a wholesale change to intermittent vertical ovens; and in these countries there are some hundreds of modern installations of this type. The author has spent over twelve months during the past four years studying gas-making systems in these foreign countries; and he is therefore fairly familiar with the varying methods employed, and with those which are likely to make good headway in England. He would therefore be bold enough to make a forecast of future developments in English gas-works, as likely to be useful to those who are supplying such works with their requirements of refractory materials.

Contracts for new installations of carbonizing plant are likely to range between continuous vertical retorts and intermittent vertical ovens, and to a much smaller extent horizontal retorts and horizontal ovens.

The two vertical systems have a number of excellent features which offer advantages over their competitors, and there is undoubtedly every reason to think that most gas engineers will in the future employ a system of bulk carbonization in entirely new installations. The continuous vertical retort system is so well known in England, and doubtless also to those present, that it will be advisable to deal at greater length with the

system of intermittent vertical ovens, as these are comparatively new in England.

INTERMITTENT VERTICAL OVENS.

Many present will be familiar with the Dessau system of vertical retorts, which, however, never came into general use in this country, though they were very largely employed on the Continent. The ovens are merely an extension of this system of retorts, the ovens being built considerably larger in all dimensions except height, which it is of the utmost importance to limit to not more than about 17 ft. There is very little fear of the intermittent vertical ovens making no more headway than the old Dessau vertical retort. The introduction of bulk carbonization and the large amount of experience gained in this system during recent years, coupled with the fact that the developments are in good hands, would seem to be a guarantee against failure.

DESCRIPTION OF INTERMITTENT VERTICAL OVENS.

The intermittent vertical oven for the most part contains a charge of 1·35 to 5 tons of coal with a 12 to 24 hour carbonizing period. The coal is charged by a travelling coal wagon into two openings at the top of the oven; but first a small quantity of breeze is dropped to cover the door and raise the bottom level of the coal into the heating zone. The coke is discharged by opening the door at the bottom of the oven. This door is mechanically operated by a rack and pinion; the rack being reciprocated by a hydraulic ram. The door is closed by the reverse movement; and it is then necessary to tighten the door on its face by means of eccentric fasteners and hand levers. The hot coke is dropped into a bogie, which is mechanically propelled to the end of the bench, where it is quenched and tipped according to local requirements. In small installations the operation of the bottom discharge door is effected by hand gear, and, further, in some designs the bottom door has a water seal to render it gas-tight.

The problem of making a durable plant is, in the author's opinion, chiefly confined to the design of the bottom door and its maintenance in a gas-tight condition for a sufficient period of years. It will be realized that the gas must find its way out of the oven without causing any appreciable pressure to be thrown on the bottom door, as leaks at that point can be very troublesome. A brief explanation will suffice to show the importance of this. In this system the charge of coke is dropped hot into a bogie underneath; and this is then in most cases drawn away to the end of the bench for quenching. Consequently, should there be gas leaks in any of the doors under which the bogie passes, these must inevitably light up, and eventually cause much damage to the doors and bottom ironwork. Such difficulties have been overcome on the Continent; but where the coal to be used is of a type which when coking is likely to block the outward and upward passage of the gas, it is found advisable to employ an ascension pipe both from the bottom and the top of each oven, to avoid troublesome gas pressure in the lower portion of the ovens.

The heating of the ovens is by producer gas burnt in the lower portions of the settings. The hot gases, after passing upwards and round the ovens, descend through recuperators, and finally go through a waste-heat boiler. The general design is compact, and readily permits of a convenient spacing of the producers and recuperators to serve the ovens. The height of the ovens also renders possible a producer and recuperator of sufficient height for full efficiency to be obtained. This is an advantage which could never be realized to the same extent in horizontal retort designs.

The advantages of the vertical intermittent oven system are clearly substantial:

(1) It is suitable for any kind of coal.
(2) It requires a minimum of ground area.
(3) It accommodates itself to the sites of stop-end horizontal retort houses.
(4) It can be operated with a minimum of labour, and if desired on two 8-hour shifts per 24 hours.
(5) The charge can be steamed satisfactorily.
(6) The coke will bear favourable comparison with that produced from the same coal in other systems, and will contain a minimum of breeze.
(7) It does, and should, produce satisfactory yields of gas, coke, tar, and ammonia from the coal.
(8) It is adaptable to the smaller works—and on the Continent there are many works with installations making from 100,000 to 750,000 c.ft. per 24 hours—while the small cost of plant to operate the ovens is a distinct advantage.
(9) The capital cost of the plant and its maintenance costs should compare well with other systems.

In further explanation of the above (No. 8), an installation of 100,000 c.ft. per 24 hours would in this country be of a size to supply a small town with a population of from 5000 to 10,000 people. It will also be noted that the charge can be steamed, the object of which is to make the required amount of water gas for the purpose of diluting the coal gas to the calorific value desired for supplying the district. All requirements of steam are produced in the waste-heat boiler which is nowadays fitted to these installations.

Pure coal gas has a calorific value of about 560 B.Th.U. per c.ft., while water gas made by steaming hot coke has a value of about 300 B.Th.U.; and consequently, by steaming the charge for a few hours (usually about three) before discharging the coke, the coal gas can be diluted to give a mixed gas of from 475 to 500 B.Th.U., as is frequently desired for supplying consumers. Contrary to expectations, this does not impair the quality of the coke, as the steaming reaction is a surface one, and while consuming carbon it takes this from the surface only of the coke—the ash released dropping off and mixing with the coke dust.

The above system of intermittent vertical ovens was originated and developed on the Continent, chiefly in Germany, but later also in France. During the past few years three firms in England have adopted these designs, and have already met with a good deal of success.

REQUIREMENTS IN REFRACTORY MATERIALS.

Refractory materials for such installations are little different from those required for other systems. In all of them high-class silica material for the walls of the ovens and retorts and the combustion chambers is essential. No other material is now being used in such parts of modern carbonizing plant as installed by the leading builders in England, the United States, or Germany. The author had the privilege of reading a paper on "The Use of Refractory Materials in Gas-Works" before this Society in 1923; and on again looking it through, it would seem that the only change of note in English practice has been the wider adoption of silica in preference to siliceous or fireclay material for retort and oven walls and combustion chambers. This change inevitably makes it perfectly clear that there must be a growing demand for the best quality of silica, especially as all the new coke oven walls and combustion flues are being built of the same material.

Silica, which has virtually no permanent expansion, or so little that it can be disregarded in the design and construction, is above all necessary, while jointing material which causes no fluxing action, and which becomes as permanent as the silica material itself, is equally necessary. Excellent progress has been made in recent years; and this has rendered possible better designs of settings, and of more durable qualities.

Apart from silica, suitable material is required for the lower portion of vertical retorts, both continuous and intermittent. For such duty the material has to resist a high temperature under a considerable load, while at the same time such portion of the charge is heavily steamed. Consequently, material of this kind must have properties of a somewhat exacting character. It is particularly important that the lower portion of the retorts or ovens in the two vertical systems should be as durable as possible, as repair of such parts, with the full weight of the structure superimposed, is difficult and expensive.

For producer linings, the toughest hard burnt firebrick or other material of equal or better quality is clearly essential, as the lasting qualities of such linings are frequently the deciding factor in the matter of keeping retorts or ovens at work. If linings are burnt away, it has been necessary to shut-down the setting to repair producer linings. Such cooling-down and heating-up of refractory material are very detrimental to its life, and very expensive in the repair work which is always rendered necessary by such shut-downs. Producer linings have a severe duty to fulfil, and the material in the clinkering zone has to withstand the cutting away of clinker which adheres to the lining. In recent years the design of producers has been much improved; and nowadays the conditions existing in the clinkering zone are not nearly so destructive as when direct-fired furnaces and flat bar grates were used. At the same time, material which would withstand the high local temperatures that are customary in certain portions of the producer would be of great value.

In a particularly good paper entitled "Notes on Horizontal Settings, with Special Reference to Silica Retorts," by Mr. Stephen Hay, of the Beckton Gas-Works ["GAS JOURNAL," Nov. 30, 1927], a valuable system was described whereby it has been possible to repair producer linings without shutting-down the setting or settings heated by such producer. In the same paper much valuable advice was given in connection with the use of silica materials in horizontal retort settings. This information should certainly be studied by manufacturers of refractory materials for gas-works.

Another class of material which is required in modern carbonizing plant is that used in recuperators, in which considerable mechanical strength and resistance to cracking are highly necessary, while at the same time the material must be close-grained, and, so far as possible, air-tight. Further requirements are accuracy of finish and uniform size and shape. A recuperator is expected to last out three or four sets of retorts; but if it becomes leaky it is worse than useless, and is merely a snare and a delusion, as are unfortunately so many recuperators. Rapid deterioration of the qualities of recuperators, which may be due to a bad design, bad workmanship, or to one or more of the above requirements being unfulfilled, has gone a long way to discredit recuperators; and partly as a consequence modern design tends more and more to extracting

waste heat in boilers after providing for partial recuperation only. This tendency has been encouraged in England by the excellent designs of waste-heat boilers which are available; these being, in the author's opinion, superior to those chiefly used in the United States and Germany.

Included in all modern carbonizing installations is a considerable quantity of firebrick material which has no severe conditions to withstand. Nothing will be gained by discussing such material at any length, other than to mention the importance of uniform shapes and sizes, as these have a considerable effect on the labour cost of doing good work. In fact, it is quite certain that there is no class of work in which it is economical to use badly-shaped firebricks for the reason that these are cheap. What is saved in material is more than lost in labour charges, while the finished job suffers in usefulness and appearance.

IMPORTANCE OF HEAT INSULATION.

Of materials used, last but not least are the insulating bricks, which are of ever-growing importance. Some of the enlightened builders are using very large quantities of heat insulating material; and there is no doubt whatever that such material yields a rich return on the outlay. At one time it was difficult to obtain good insulation material, and no one seemed to know anything about it. Fortunately, this ignorance is giving way to increased knowledge on the subject; but the author is convinced that there is still very great scope for large savings in this direction. Vertical installations lend themselves very readily to the use of insulating material, and more so than do horizontal settings or coke ovens.

The fuel used in heating modern carbonizing plant, reduced as it has been to 13 to 16 lbs. of coke per 100 lbs. of coal carbonized, is still about four times as expensive as the labour cost of operating the plant. In this connection, however, it is only right to point out that waste-heat boilers, where used, have materially reduced the higher cost of fuel as compared with labour.

Improved insulation will render possible the economic variation of carbonizing plant to suit fluctuating demands for gas. At present it is wasteful in fuel to operate plant much below its full capacity, due to high radiation losses. With efficient insulation this will become economically possible, and so enable gas companies to avoid the destructive shutting-down of carbonizing plant for the summer months.

TUNNEL KILNS.

The author looks forward to the wider adoption of tunnel kilns for the burning of silica material, as the easily controlled hot temperature zones through which all the material must pass during a sufficiently long period to ensure thorough conversion of the material have obvious advantages over the conditions existent in even the best-controlled down-draught kilns. Such kilns in Germany are fired with producer gas from mechanical producers using small coke and breeze; while temperatures in the hottest portion of the kiln are controlled by sensitive draught regulators, which are operated in conjunction with pyrometers. By such means the proportion of defective material is reduced to a very small percentage.

It is obvious that to work a tunnel kiln commercially a continuity of orders for suitable material is a *sine qua non;* and clearly this is not always obtainable.

STANDARDIZATION OF SHAPES.

This question is associated to some extent with standardization of shapes; and much time has already been lost in regard to this matter. It is clear that the adoption of foreign designs of carbonizing plant will make matters worse than ever; and it is really high time that the makers and users put their heads together and formulated proposals with standardization in view. If this is not done, the position must become chaotic, to the everlasting detriment of both manufacturers and users.

The author had intended to deal with other types of carbonizing plant; but when writing this paper he came to the conclusion that it would be better to limit himself to the one new system which has made its appearance in several works, rather than to deal also with those which may be expected in the future.

The logical method of dealing with coal is to carbonize it; and to do this effectually and economically, suitable refractory materials are essential. It is equally essential that makers and users of such materials should discuss their points of view, in order to make each other familiar with their difficulties and requirements. This must be my excuse for again introducing this subject to your attention.

SCOTTISH JUNIOR GAS ASSOCIATION.

(EASTERN DISTRICT.)

The Annual Summer Outing and Visit of the Scottish Junior Gas Association (Eastern District) took place under ideal weather conditions on Saturday, June 2. About fifty members, many accompanied by lady friends, met in the forenoon at the Kennoway Works of the Kennoway and Largo Gas Company, Ltd. While the members inspected the plant at these works, under the guidance of Mr. E. L. Farquhar, the Manager, who is the President of the Association, the ladies were conducted over the Kennoway Den by Mrs. Farquhar.

The party were then conveyed to the Lower Largo section, to the holder of which gas is delivered from Kennoway by 6½ miles of high-pressure mains. Here were seen the arrangement of reducing valves, and a small but attractive showroom. The visitors were then driven to the Victoria Boarding House, at Lundin Links, where they were entertained at luncheon by the Gas Company.

Mr. J. L. BENNET, Chairman of the Kennoway and Largo Gas Company, Ltd., expressed his pleasure at seeing so many visitors present.

Mr. FARQUHAR, replying on behalf of the Association, expressed the appreciation of the members, and added his personal thanks to the Directors for their kindness in allowing the Association to visit their works.

The sports items were then carried out; every visitor, lady or gentleman, taking an active part in one or another of the games.

The golfing match resulted as follows: The special scratch award, presented by the Directors of the Company, and also the 1st Handicap prize, presented by Mr. Henry Rule (Gas Engineer, Kelty), was won by Mr. J. R. Stevens, of Elie; 2nd Handicap, Mr. Wm. Ramage, of Dunfermline; 3rd Handicap, Mr. H. A. Aitken, of Leven; 4th Handicap, a tie, Mr. A. A. Morriss, of St. Andrews, and Mr. M. White, of Dunfermline.

The bowling competition was won by Mr. H. Gourlay (Markinch) and Mr. D. Warden (Dundee), 1st Rink; and Messrs. Wm. Balfour (Bridge of Allan), M. Marshall (Kennoway), F. Henderson (Windygates), and R. Allan (Markinch), 2nd Rink.

At tea, which followed, Mr. R. J. GAVIN (Kirkcaldy) expressed the visitors' appreciation of the arrangements made. He congratulated the Board on the efficiency of their works at both Kennoway and Largo.

Mr. J. O. SCOTT, a Director, presented the prizes to the winners of the competitions, and afterwards assured the visitors that it was a great pleasure to receive the Association.

NON-FERROUS METALS RESEARCH.

The British Non-Ferrous Metals Research Association presented their eighth annual report to a meeting of members held in Birmingham on May 14. The importance of the work carried out is shown by the fact that the expenditure on experimental work in 1927 amounted to £20,000, as compared with £600 in 1920. Nearly 85 p.ct. of the Association's income has been spent on productive work; 36 researches being in progress or already completed.

Many of these investigations deal with matters of prime importance to the engineering and electrical industries, as is indicated by the following few examples from the programme: Influence of impurities on copper; improving the soundness of brass castings; lead alloys for cable sheathing; the exploration of alloys for high-temperature service; locomotive firebox stays; atmospheric corrosion; die-casting alloys; new alloys for condenser tubes.

With experience and sustained effort, the practical value of the results of the Association's researches is becoming more and more appreciated. A new Development Section has been founded to assist members to apply in their works the new products and improvements of processes arrived at from the researches. This new service is already greatly appreciated, and forms a practical means of bridging the gap so often found between science and industry.

The grant from the Government Department of Scientific and Industrial Research has been increased, and indicates official approval of the organization and work; but urgent demand exists for a corresponding increase in support from industry, which is looked for largely from engineering and other users of non-ferrous metals and alloys, who stand to benefit so greatly from the Association's work in affording improved materials. Advances in engineering depend so much on the provision of new materials of construction that direct contact with such an organization is essential to all who wish to keep in the van of progress.

Mr. Gilbert C. Vyle, at the meeting, urged that all industrial firms should make provision in their accounts for research expenditure on a scale sufficient to balance the items of depreciation in plant and machinery and of obsolescence of ideas and processes.

The annual report, obtainable from the Association's offices, 71, Temple Row, Birmingham, gives a clear account of the work in progress; and its perusal should stimulate greatly increased membership.

THE THOMAS RECORDING CALORIMETER.

Investigation by the Fuel Research Board.

There has been published by H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, at 9d. net, Fuel Research Technical Paper No. 20, which describes an exhaustive investigation, carried out at H.M. Fuel Research Station, of the behaviour of the Thomas recording calorimeter. This apparatus was originally made by the Cutler Hammer Company, of New York, and the first instrument tested was made by that firm. These tests, which were carried out at the request of the Cambridge Instrument Company, indicated that the principle on which it worked was sound, but brought to light certain defects, mainly in the recording mechanism. The Cambridge Instrument Company then re-designed certain portions of the instrument, which was again tested, and it was found that the main defects had been satisfactorily overcome, but minor modifications were still required. Further modifications were made, and found successful.

The results on the present form of the instrument show that, if properly installed and adjusted, and given reasonable care in maintenance, it should give a reading, when working on a gas of steady calorific value, correct to ± 1 B.Th.U. There is a time lag before correct indications are given of a change in calorific value, and when rapid fluctuations occur their full extent is not indicated, but the mean value recorded is correct.

The investigation was carried out by Mr. A. Blackie, with the assistance of Messrs. C. W. Ockelford, C. Baker, and J. S. Hales. The analytical work was supervised by Mr. D. MacDougall, and the course of the investigation was guided by Dr. J. G. King, the Chief Chemist of H.M. Fuel Research Station.

The following conclusions have been arrived at by a careful consideration of all the tests made on the calorimeter, and relate to its performance in its present or re-designed form.

On gases of steady calorific value (of 500 to 600 B.Th.U.) the calorimeter when driven at normal speed will record a reading under most conditions of not more than ± 1 B.Th.U. different from that given by a standard Boys calorimeter, provided that the " cold balance " is correct.

The time taken to attain a true " cold balance " is 25 to 34 minutes on starting, and 22 to 32 minutes after extinguishing, the calorimeter flame. The time required to attain a steady reading after lighting the calorimeter burner is about 20 minutes. If the calorific value of the gas be changed, the first indication of the change takes place after the lapse of about 4 minutes.

On changing from one gas to another, the full value of the change (up to changes of 50 B.Th.U. in 600) is shown in from 14 to 20 minutes after the change has been made. More rapid changes of calorific value are recorded to the following extents for different periodicities of change; the full changes being in this instance about 30 B.Th.U.:

Period of Changes.	Percentage Shown.	Speed of Motor.
Min.		
10	95	Normal
7	90	"
5	81·5	"
5	74	Supernormal

On very rapid and regular changes of gas supply—at 2·5-minute intervals—the periodicity of the changes is shown accurately. The amplitude of the variations is, however, greatly reduced, while the lag of the maxima and minima is about 6·5 minutes after the corresponding change in the gas—a quantity made up by the lag of the instrument (4 minutes) *plus* the duration of the period of the change (2·5 minutes). A medium line drawn between maxima and minima represents, however, the true mean calorific value of the two gases supplied if the changes are at regular intervals.

Changes in speed of the motor to speeds of above or below its normal value of 1450 R.P.M. have small permanent effects. For a speed subnormal by 100 R.P.M., the fall of B.Th.U. recorded is negligible, while for a speed supernormal by 100 R.P.M. a rise in the record of not more than 3 B.Th.U. may be shown.

During any change of speed of the motor a temporary fluctuation of from ± 8 to 12 B.Th.U. per 100 R.P.M. change may be observed if the change is rapid. This is in the direction of a fall and subsequent rise for a rise of speed, and the reverse for a fall of speed. The duration of such an oscillation may be in such a case about 10 minutes. Changes of speed (or applied voltage) should be kept within 0·25 p.ct. if possible, and bearing friction kept as low and as constant as possible. A change of speed of this value does not cause fluctuation of the record of more than ± 0·5 B.Th.U., and lasts for 2 to 3 minutes. The cause of such fluctuations is due apparently to the different resistances met with by the air and gas streams in the different pipes, drums, and burner paths, necessitating a certain lapse of time before equilibrium is re-established under the new conditions. The foregoing effects are not noticed when running on " cold balance," as under this condition the air and gas are not changed in temperature. The instrument is most accurate, responds better to changes, and the curve traced is less subject to fluctuations when the motor is run at normal speed—about 1450 R.P.M.

Variations of barometric pressure and atmospheric temperature within normal limits are negligible. Differences of temperature between the atmosphere and the water in the tank have no definite effect within normal limits. Variations of pressure of the gas supply of from 1·5 to 6·5 in. of water have no effect. Changes in the level of the water in the tank cause an alteration of recorded calorific value of + 18 B.Th.U. for a decrease of level of one-tenth of an inch. No such changes take place if the bucket-chain is working properly.

The recorder as re-designed appears to operate satisfactorily both when running with the calorimeter on cold balance or when working with the burner lit. No tendency of the galvanometer needle to stick to the jaws or " hunt "' is now observable. Changes in period of contact making on the needle of the galvanometer or changes in the voltage supplied to the recorder and resistance thermometers appear to make no difference in the record, provided that these changes are kept within practical and reasonable limits.

In comparison with a water-flow recording calorimeter and with a recording calorimeter depending on the differential expansion of two steel tubes, all being operated on the same variable gas, it was found that the Thomas calorimeter followed the variations rather more accurately than the first and considerably more so than the second. The time lag of the instrument was, however, rather greater than that of the water-flow type and considerably greater than that of the expansion type. It also does not record some of the minor temporary variations shown by these types, but smooths them out to a mean value. This is probably partly due to the larger volume of the chamber from which the gas is drawn, &c., in the Thomas calorimeter.

No trouble was found to arise from the design of the burner or mechanical parts of the calorimeter; and the design of the recorder may now be considered satisfactory. The report concludes by stating that, with ordinary care in manipulation, the whole may be regarded as a sound and very accurate recorder.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Low-Temperature Tar Oils.

SIR,—The abstract from the paper read by Prof. G. T. Morgan, F.R.S., before the recent Conference of the Society of Chemical Industry (published in the " JOURNAL " for May 23) is of absorbing interest to those occupied with research on the oils produced by the low-temperature carbonization of coals. Especially interesting is the Professor's reference to the solvent operation of the tar oils with the almost complete disappearance of the solid pitch.

For some time past the writer has been occupied in the finely appointed laboratory of the Carlton Main Colliery Company, Barnsley, in this line of research on the tar oils produced from the low-temperature plant installed at the colliery.

By the usual methods of fractional distillation, the first fraction up to 170° C. is a spirit, which requires trouble to render water-white; but we start treating the tar oils as they come direct from the condensers by washing with absorbent reagents, obtaining thereby the phenols, cresols, and tar acids and bases, which easily separate out.

The balance left in the absorbing washer we term hydrocarbon oils, which, when treated with petroleum ether, yield a water-white spirit permanent when exposed to light for any length of time, and from which the ether can be readily separated.

After the extraction of the spirit, the residue is a thick oily substance which contains but a tiny fraction of a soft, curious amorphous carbon residue. This oily substance—which has practically no smell—when applied to a heated metal substance with a soft brush hardens with the appearance of an elastic surface similar to a first-class black Japan varnish, and when thinned down with a suitable medium presents a bright golden colour.

The intriguing part of the business, however, is that a water-white spirit comes off at the tail end of the operations, and no pitch.

We are now hammering out a method of recovering the reagents employed.

F. D. MARSHALL.

19, *Queen Anne's Chambers,*
Westminster, S.W.,
June 12, 1928.

REGISTER OF PATENTS.

Gas Turbines.—No. 288,929.

PERRESS, J. H. L. & T. E. L., both of South Hampstead, N.W. 3.

No. 31,475; Nov. 23, 1927.

This invention has reference to an internal combustion or gas turbine which provides for simplified construction in relation to reciprocating engines, with greater power output per unit of fuel employed than that given off by a reciprocating engine.

The invention consists of a turbine wherein gas and air from a pressure chamber impinges on the blades of the rotor and turns the same till such time as the mixture is ignited and exploded. The pressure created then, by reacting on stationary vanes or blades, carries round the rotor while the gases escape; the rotor, and its vanes or blades, as it travels being cooled in a sump, and any gas, air, or liquid, which might be carried along by the rotor, being prevented from reaching the pressure chamber by passing the rotor through a vacuum chamber.

The turbine comprises a casing, a rotor constituted by a disc with a broad brim fitted with a central and circumferential ring of upwardly and rearwardly inclined vanes or blades, a roof member disposed in the upper part of the casing and partly covering the upper part of the rotor, a vacuum chamber, a gas and air pressure chamber, and a stationary blade carrying chamber by the roof member (the gas and air chamber being located between the vacuum and the stationary blade-carrying chambers), means for igniting and exploding a charge, and means—such as blowers, fans, or the like—to supply the gas and air chamber with gas and air under pressure and to maintain a partial vacuum in the vacuum chamber.

A feature of the invention is that packing pieces, constituted by any convenient anti-friction metal, or by asbestos or the like, engaged in a groove in the rim of the rotor and each side of the vanes or blades thereof and in the roof member which is shaped to fit the rim of the rotor, and that springy blades or plates are provided at convenient points in the roof member to maintain gas and air tightness, and that the lower part of the casing of the rotor constitutes a sump cooled by water or other convenient liquid through which the rotor passes.

Burners for Gas Cookers.—No. 289,202.

DAWSON, H., of Sutton Coldfield.

No. 4948; Feb. 22, 1927.

The purpose of this invention is to provide simple and effective means for cleaning the orifices of the gas nozzles which supply the atmospheric burners of gas cookers, &c. This is effected by pusher pieces situated opposite the said nozzles.

According to one construction, a thin rod, or a rod carrying a thin wire, has at its outer end a knob for hand manipulation, and its forward end is pointed and is desirably of the same diameter as that of the orifice of the gas nozzle. The rod is horizontally arranged to slide within a screw-threaded sleeve adapted for detachable attachment to the bore of a screw-threaded union or **T**-piece connecting the ends of two conduits; and the gas nozzle with which the slidable rod is to co-operate is screwed to the union of the **T**-piece through the wall of the latter in axial line with the slidable rod. In order that the rod shall not become detached from the sleeve a stop collar is provided thereon to abut against the inner end of the sleeve; and a coiled spring is interposed between the exterior of a gland nut screwed into the sleeve and the adjacent face or end of the knob. The bore of the gas nozzle is desirably tapered, so that when the rod is depressed to clean away any foreign matter adhering to the orifice gas has a free passage within the bore, and the restriction of gas will only be momentarily.

Scaling Coke Ovens.—No. 289,308.

CAPIAU, G., GAQUIER, M., and LAHAUT, L., of La Louviere, Belgium.

No. 21,072; Aug. 10, 1927.

This invention relates to a process of removing incrustations of graphite such as are formed in the carbonizing chambers of coke ovens.

The process consists in projecting on the graphite, preferably when same is still hot, a jet of compressed air carrying a hard powdered or granular material, adapted to cut into the graphite. The oven is kept at a temperature substantially equal to its operative temperature.

The material used may be plumbago or crushed slag; and a jet of air at a pressure of at least 7 atmospheres is employed.

Sulphate Manufacture.—No. 289,950.

ROBSON, S., of Avonmouth.

No. 3140; Feb. 3, 1927.

This invention is for the direct production of substantially pure sulphate of ammonia by bringing together ammonia, sulphur trioxide produced by the oxidation of sulphur dioxide with the aid of a catalyst, and water—all the reactants being in the form of gases, vapours, or disperse systems whose continuous phase or dispersion medium is gaseous. Substantial formation of sulphite of ammonia is avoided, which obviates the necessity of making special provision for its subsequent oxidation to sulphate. Of course, the oxidation of sulphur dioxide to sulphur trioxide is seldom complete, and there is some sulphur dioxide present in the reactant. Its proportion, however, is kept small relatively to the sulphur trioxide.

The patentee gives examples of how the invention may be carried out. One method is as follows: Ammonia liquor having a water content proportional to the desired dilution of the product is sprayed into a vessel to which sulphur trioxide is admitted; the quantities being suitably regulated for the formation of sulphate of ammonia. The gases issuing from the vessel may be scrubbed in any convenient manner.

In another method of procedure, sulphur trioxide in the form of gas from a catalyst chamber is wetted so as to carry forward the requisite amount of water for the desired final condition of the product. Ammonia gas is also led into the vessel in the proportion required for the reaction. Sulphate of ammonia is immediately produced, and is led into a bag filtration house or other suitable collecting device. By proper control, dry and substantially neutral sulphate can be obtained.

Heat Insulation.—No. 290,340.

SOUTH METROPOLITAN GAS CO., CHANDLER, D., and THOMAS, J. S. G., all of Old Kent Road, S.E. 15.

No. 3704; Feb. 9, 1927.

This invention relates to improvements in heat insulating devices, and is applicable to heating appliances, such as cooking stoves, which have an inner and outer casing forming a chamber.

According to one feature of the invention, one or more sheets of polished metal separate the inner and outer walls of the chamber and thereby reduce the loss of heat by radiation. According to another feature, in order to reduce the quantity of heat lost by convection, the sheet or sheets of polished metal may be formed so as to divide the chamber into a plurality of horizontal or substantially horizontal compartments. It is to be understood that the term "metal sheet" is not intender to cover a sheet of metal having a thickness less than 0·4 mm., and that no claim is made to the use of metal foil.

In one form of construction, as applied to a gas stove, the inner and outer walls of the chamber are separated by a highly polished metal sheet having a plurality of horizontal, preferably **V**-shaped, corrugations which divide the chamber into a plurality of horizontal compartments, the corners of the **V**-shaped corrugations being close to, but out of contact with, the walls. In order to position the sheet, one or more of the corrugations may extend completely from the inner to the outer walls.

Lighting Controller.—No. 290,386.

ANDERSON, J., and ALDER & MACKAY, LTD., both of Edinburgh.

No. 5399; Feb. 25, 1927.

This invention is for the direct production of substantially pure by the same firm in 1914, wherein clockwork brings about a desired cycle of by-pass and main burner lighting.

The present invention consists in means for the control of the supply of gas to burners with by-passes comprising a disc with peripheral ratchet teeth and a boss mutilated by cutting away parts of the boss to leave distribution passages which are always open to the gas supply and are adapted to make connections with main and by-pass burners respectively. The distribution passages are in the form of radial slots arranged first to uncover the connection to the by-pass burner; then to uncover (at least in part) the connection to the main burner while still leaving wholly or partly uncovered the connection to the by-pass burner; then to cover the connection to the by-pass burner while fully uncovering the connection to the main burner; then to uncover the connection to the by-pass burner while the connection to the main burner is still in part open; then to cover the connection to the main burner while the connection to the by-pass burner is fully open; and then to repeat the cycle.

The controller itself comprises a ground valve seating formed of an upstanding ridge with two gas connections within the ridge ground to the same height as the ridge, one leading to a main burner and one to a by-pass burner; the mutilated boss of the ratchet disc also being ground on the face which seats on the ridge and the gas connections.

Coal Distillation.—No. 290,551

NIELSEN, H., of Muswell Hill, and LAING, B., of Westminster.

No. 6804; Dec. 4, 1926. No. 6803; Feb. 21, 1927; No. 6802, May 18, 1927.

According to this invention, which relates to the distillation of coal in such manner as to obtain uncracked oils, the raw material is preferably subjected to preliminary preheating, and may enter the retort at 150° and leave at 550° C. To maintain a range of temperature difference of approximately 100° C. between the temperatures prevailing at the middle and the outside of the coal particles, the duration of distillation must be about two hours. The heating medium may be producer gas, water gas, or inert combustion gases, though external heating, or a combination of internal and external heating, may be used. With internal heating, the gases flow countercurrent to the coal, and enter at 650° and leave at about 100° C. The patentees claim, by their method, to produce from the so-called crude oils resulting from the distillation of bituminous coal a lubricating oil of a standard equivalent to that obtained from the finest well oils.

The temperature zones throughout the length of the retort are graduated so that the oils are distilled off at the temperatures at which they volatilize, and are then withdrawn from the apparatus in uniflow with the heating medium either at one end or at different

points along the length thereof, and at temperatures at which no excessive cracking can occur. The volume of inert gas, the sensible heat of which is employed as the distilling medium, is preferably so controlled as to lower the vapour pressure of the volatilizable oils as much as possible. The volume of gas employed for distillation purposes may be of such a magnitude (*e.g.*, 35,000 up to 100,000 c.ft. per ton of carbonaceous material) that the vapour tension of the heaviest oil fractions present is lowered sufficiently to enable the oils to be liberated in vapour form at temperatures not exceeding 450° to 500° C.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for May 16.]

Nos. 13,348—14,061.

ABRASSART, A.—"Distillation of fuels." No. 13,455.
HACKFORD, J. E.—"Low-temperature carbonization of coal." No. 14,006.
HOLMES, G. E.—"Washers for cleaning gases." No. 13,747.
LAING, B.—"Distillation of solid carbonaceous materials." No. 13,820.
METERS, LTD.—"Gas meters." No. 13,353.
NIELSEN, H.—See Laing, B. No. 13,820.
STANSFIELD, A.—See Meters, Ltd. No. 13,353.
TRIBE, W. E.—"Incandescent gas mantle holder." No. 13,660.
WEYMAN, J. E.—"Atmospheric burners." No. 13,731.
WILSON, J. H.—"Lubrication of gas meters." No. 13,746.

[Extracted from the "Official Journal" for May 23.]

Nos. 14,062—14,798.

COLE, R. C.—"Gas heated hot water apparatus." No. 14,558.
FLETCHER, J. A.—"Wet gas meters." No. 14,326.
GIBB, D. M.—"Atmospheric gas burners." No. 14,169.
LAING, B.—"Rotary retorts for distillation, &c., of carbonaceous materials." No. 14,625.
MEEKCOM, C.—"Gas cooker." No. 14,102.
MORRIS, E. B.——"Means for preventing leakages in pipes." No. 14,096.
NIELSEN, H.—See Laing, B. No. 14,625.
NORMAN, C. R.—See Fletcher, J. A. No. 14,326.
PARKINSON STOVE COMPANY, LTD.—See Gibb, D. M. No. 14,169.
SIMPSON, S.—"Gas meters." No. 14,384.
VALETTA, M.—"Coin freed supply meter mechanism." No. 14,743.

[Extracted from the "Official Journal" for May 31.]

Nos. 14,799—15,580.

BINTE, H.—"Screening plant for coke." No. 14,851.
BRAACH, P.—"Gas cookers." No. 15,403.
CLAYTON, R. H.—"Purification of coal gas." No. 15,069.
COLEY, H. E.—"Apparatus for low-temperature carbonization." No. 15,118.
COX, F. J.—"Gas stoves." No. 15,125.
HUMPHREYS & GLASGOW, LTD.—"Apparatus for manufacture of water gas." No. 15,123.
I. G. FARBENINDUSTRIE AKT.-GES.—"Production of gases rich in olefines from bituminous coals." No. 14,999.
I. G. FARBENINDUSTRIE AKT.-GES.—"Destructive hydrogenation of carbonaceous materials." No. 15,410.
MANCHESTER OXIDE COMPANY, LTD.—"Purification of coal gas." No. 15,069.
MASCHINENFABRIK AUGSBURG-NURNBERG AKT.-GES.—"Gas engines." No. 15,300.
MENDEL, S.—"Automatic safety apparatus for gas lighting, &c., apparatus." No. 15,073.
METROPOLITAN FUEL COMPANY, LTD.—See Cox, F. J. No. 15,125
OTTO, C., and OTTO & CO. GES., Dr. C.—"Gas-producing ovens." No. 15,404.
PRESTAGE, E.—"High-speed gas compressors." No. 15,394.
RIGHTON, W. J.—"Geysers." No. 15,122.
ROSENBERGER, H.—See Braach, P. No. 15,403.
STELFOX, J. C.—"See Humphreys and Glasgow. No. 15,123.
SURFACE COMBUSTION COMPANY.—"Heat-treating furnaces." No. 15,023.
WEST & CO., LTD., H. J.—See Prestage, E. No. 15,394.
WOODALL-DUCKHAM (1920), LTD.—"Repairing heated structures." No. 15,307.

[Extracted from the "Official Journal" for June 7.]

Nos. 15,581-16,189.

HACKFORD, J. E.—"Low-temperature carbonization of coal." No. 16,070.
KENDALL, D. J. P.—"Dry gas-meter." No. 15,734.
MOSER, A. D.—"Gas fired heat radiators." No. 15,703.
WILSON, D. L.—"Prepayment gas meters." No. 16,014.

Progress at Plymouth.—The Chairman of the Plymouth Corporation Gas Committee, Major Clifford Tozer, reporting to the Town Council at their meeting on Monday, June 4, said that the results of last year's working of the gas undertaking had been distinctly satisfactory. They had made a net profit of £15,392, which had enabled them to pay back the amount advanced towards the deficiency of the previous year, £12,761. They did not desire to make large profits, though it was necessary during the last twelve months to make something over £12,761, in order to meet the deficiency. The profit actually made was within £300 of their estimate twelve months ago. The Committee had been able to reduce the price of gas by 4d. per 1000 c.ft. for the current year.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Windermere Gas and Water Bill: Further Standing Orders complied with.

St. Ives (Hunts) and United District Gas Orders: Referred to the Special Orders Committee.

HOUSE OF COMMONS.

Progress of Bills.

Bournemouth Gas and Water, and Tottenham and District Gas Bills: Further Standing Orders complied with.

Rotherham Corporation Bill: As amended, considered; read the third time, and passed.

York Town and Blackwater Gas and Electricity Bill: Reported, with amendments.

St. Ives (Hunts) and United District Gas Orders: Copies presented.

YORK TOWN AND BLACKWATER GAS AND ELECTRICITY BILL.

This Bill was before the Unopposed Committee of the House of Commons on Wednesday, June 6, and was ordered to be reported for third reading. It was explained to the Committee that the Company was incorporated in 1904, and obtained an extension of area in 1909. The main object of the Bill is to convert the existing ordinary capital into stock of one denomination—viz., 5 p.ct.—and also to convert the preferred stock into a 5 p.ct. stock. Some difficulty had arisen with the Board of Trade regarding 150 £10 shares issued in 1902, when the Company was still a limited Company, under a contract to pay 5 p.ct. dividend free of income-tax. At that time, of course, the income-tax was much lower than at present, but the Board of Trade now reported that under present conditions of a much higher income-tax, the holders of these shares were, in effect, getting more than 5 p.ct.; and it was pointed out to the Committee in a Board of Trade report that this position would be perpetuated under the present Bill. The Committee decided to allow the proposal to go forward.

The Company by the Bill proposes to raise an additional £100,000 capital, and also takes £50,000 new borrowing powers; the whole of the existing capital powers being exhausted except £6300 loan capital.

The preamble of the Bill having formally been proved, it was ordered to be reported for third reading. (The Bill has already passed the House of Lords—see "JOURNAL" for May 9, p. 401.)

LEGAL INTELLIGENCE.

SEQUEL TO A STREET EXPLOSION.

Carrickfergus Gas Company Exonerated.

The Carrickfergus Gas Company were exempted, and the Urban Council mulcted, in an interesting joint action brought against them at the Belfast Quarter Sessions by a shopkeeper of the town to recover £50 damages for injury to his shop, premises, and goods, from an explosion on Nov. 26, by the alleged negligence of defendants. The amount of the loss and damage, it was set out, was £58, but the plaintiff abandoned the excess over £50. The Plaintiff (Mr. Frederick Stocker) said he used the front of the premises as a boot shop, and the rear as a workshop. He used no gas in the latter. There had been a pipe there, but he got a plumber to cut it off 21 years ago. On Nov. 24 his workmen made a complaint to him, and as a consequence he went to the workshop and found a smell of gas. He had the place examined by a plumber, who told him to turn the gas off. The first he heard of the explosion was at 3.30, when he was at a football match. The Urban Council had been doing some road work, and were using a scarifier and steam roller. Following the explosion, witness went to Mr. Campbell, the Manager of the Gas-Works, and he and the Clerk of the Council examined the place. Excavations were commenced on the following Monday, and on Wednesday a main pipe was found cracked, which was the cause of the escape. Under cross-examination, witness said that, in spite of a smouldering fire and a smell of gas, he closed his workshop on Saturday and left it. The fire was practically out. He did not know what caused the explosion. Counsel for the Gas Company asked for a direction on the grounds that no evidence was given connecting the explosion with a broken main. His Honour refused to grant a direction. Mr. Robert Campbell, Gas Manager, Carrickfergus, said that the pipes were laid in the street 26 years ago. They were in good condition and had 3 ft. of cover, which was sufficient to protect them from injury in ordinary circumstances. He did not hear anything of the alleged escape until after the explosion. He inspected the place, and told the plaintiff then that he expected it was a broken main in the street. Searching for the leakage, they found, after two days' operations, that a main had been broken in two. There was no sign of weakness or defect. In his opinion, the road being scarified, and the engine being unable to pull the scarifier, the jumping of the engine was the cause of the break. His Honour said that the Urban Council were liable; and he gave a decree for £50 against them. The Gas Company were entitled to a dismiss; and he thought the plaintiff should add the cost of the dismiss as against the Urban Council.

MISCELLANEOUS NEWS.

GASHOLDER SITE AT WALTON-ON-THE-NAZE.

Powers of the Board of Trade under the Gas Regulation Act.

There was an interesting discussion in the Town Hall, Walton-on-the-Naze, on June 1, when Mr. JAMES F. RONCA (Director of Gas Administration at the Board of Trade) held an inquiry into an application by the Tendring Hundred Water-Works Company for a Special Order under section 10 of the Gas Regulation Act. The object of the Order is to authorize the Company to erect on a specified site a gasholder, which holder has already been put up—the Company having, as was pointed out during the proceedings, complied with what were known to be the wishes of the Local Authority, who had sold them the site definitely for the purpose of erecting a holder thereon; and thus forwarding the scheme, under the provisions of the Company's 1921 Act, for the removal of the gas manufacturing plant to another part of the district and the clearance of the old site. Objection was raised by a number of owners, lessees, and occupiers of dwelling houses within 300 yards of the new holder.

Mr. H. ROYSTON ASKEW (instructed by Mr. Stanley Nicholson) appeared for the Company; while the forty objectors were represented by Mr. ROBERT FORTUNE (instructed by Messrs. H. Boustred & Sons).

Mr. ASKEW, in opening the case for the Tendring Hundred Water-Works Company, remarked that the only question in issue had relation to the storage of gas on a certain piece of land adjoining the station. He did not propose to go into any details of the past history of the Company, with the exception of circumstances which had led up to the present application. The Company was incorporated by an Act of 1884 to supply gas and water, and was the successor in title of a previous Company which had powers under a Provisional Order of 1878. Acts subsequent to the one he had already mentioned were obtained. The area for the supply of gas was a large one, and included Walton, Frinton, and many other places. For a period of about half-a-century the undertaking had provided the two important public utility services of gas and water over a considerable district, and had done so on the best of terms with the local authorities concerned and the consumers. The works for the supply of gas had been since the commencement upon the present site near the railway station, and in the middle of that part of the town; but in 1921 a fresh proposal was put forward. In that year the Company was in Parliament with a Bill for various gas and water powers; and by that time, owing to the development of the sale of gas, the site had become congested with plant, and there was no room for further extensions.

SCHEME FOR THE REMOVAL OF THE GAS-WORKS.

Accordingly, the Company, in agreement with the Urban District Council, made the suggestion that the gas-works should be moved to a new site farther afield. By section 38 of the Act of 1921, the Company was empowered to construct and maintain gas-works on a site described in the schedule, which was in Kirby, not far from the railway station there. Section 40 gave power to construct works which consisted of a line of pipes connecting Walton with Kirby; and this had been carried out. No gas-works had as yet been constructed at Kirby. Section 39 was the one which gave effect to the arrangement for removing the works away from Walton within five years; and it was in the following terms:

> The Company shall within five years from the passing of this Act, or such further period as may be reasonable in any exceptional circumstances then prevailing, and as may be agreed between the Company and the Walton-on-the-Naze Urban District Council, or as in default of agreement shall be determined by an Arbitrator to be appointed by the Board of Trade, remove the existing gas-works from their present site in the parish of Walton-le-Soken, and shall cease thereon to manufacture gas or to manufacture, work up, or convert residual products arising directly or indirectly from the manufacture of gas; provided that nothing in this section shall prevent the Company from maintaining and renewing in its present position thereon one of the existing gas holders (to be selected by them), and from storing gas thereon and supplying gas therefrom.

In this connection, he explained that there were two holders on the existing manufacturing site; but one of them was small, and very old. The other was considerably larger. Briefly, this was the state of affairs in 1921. Since that date, the Urban District Council had agreed to extend the time for the removal of the works to a further period of five years, which would expire at Midsummer, 1931. It had also been agreed that by that time the whole of the existing gas-works site should be cleared and handed over free of buildings and plant, including holders; and the Council had agreed to sell to the Company a site for a new gasholder.

THE HOLDER IN DISPUTE.

Though the intention was to erect new works for the manufacture of gas at Kirby, which was some 2½ miles away, it would, of course, be absolutely necessary that there should always be storage capacity for a considerable quantity of gas in Walton, to enable the Company to maintain an adequate and satisfactory supply. Further, the consumption of gas was growing rapidly, and even the larger of the existing holders at the works was becoming too small. The site selected for the new holder was a piece of land which formed part of the Urban District Council's electricity generating station, and was land which was scheduled for the generation of electricity. The advantage of this site was that it grouped the generating station and the gasholder within one curtilage, which was very reasonable. An inspection would reveal the fact that on one side the site of the holder immediately adjoined the railway goods yard sidings; while on another side of it there were the generating station and the chimney shaft, which was of considerable height. On the third side there was a cemetery; and on the remaining one, a slaughter house, coal yard, and cartage depôt. In fact, it was a site which had been dedicated to industrial purposes before ever the proposal to erect the gasholder was made. The site was sold by the Council to the Company in the autumn of last year; and the Company had covenanted to use the land for the storage of gas, and for no other purpose whatsoever. The holder at the existing works to which he had referred as being the only one available had been up for many years. It was already patched and required repair; and as it had been agreed to clear the site and remove that gasholder by a date which was now only three years distant, and further as the growth in the consumption of gas necessitated a larger holder (the margin of storage in Walton being now very low), it would be obviously uneconomical and wasteful to spend money on repairs to the existing holder. Accordingly, and having regard to the fact that the new site had been sold to the Company for the specific purpose of erecting a holder, the Company felt justified in proceeding almost at once to put up a holder. They thought that, in all the circumstances, the agreement come to with the Local Authority was a clear indication that there would be no opposition.

Unfortunately, however, this anticipation had not been fulfilled. Plans of the holder were drawn up and submitted to, and approved by, the Urban District Council; and the work was started. During the erection—on Jan. 6, 1928—the Company took steps to serve upon the owners, lessees, and occupiers of the dwelling houses within 300 yards of the proposed site, the notices which were required by section 5 of the Gas-Works Clauses Act, 1871. Now, 300 yards was a very considerable distance, in a comparatively built-up area; and no less than 339 owners, lessees, and occupiers fell within that radius. A similar radius struck from the existing holder on the old site would have included many more people. Of the 339 persons upon whom notices were served, some 200 consented, 90 did not reply, and there were about 50 refusals. In view of this number of refusals, there was, of course, only one course open to the Company—to apply for a Board of Trade Order sanctioning the storage of gas on the site referred to. The Order itself was quite brief, and, in fact, contained only one operative section, authorizing the Company, on the land described in the schedule, to erect and maintain one gasholder, with all necessary machinery and apparatus connected therewith, and do all such acts as might be proper for storing and supplying gas in the limits within which they were for the time being authorized to manufacture and supply gas. These were the circumstances which had led up to the application. The Company were complying with what they knew to be the wishes of the Local Authority, who had sold them this site specifically for the purpose of erecting the holder and enabling the old site to be cleared. The new site, as he had pointed out, was one which was already earmarked for industrial purposes; and although there were a number of dwelling houses within 300 yards, all these houses were within an equal distance of one or other of the industrial objects which met the eye. For this reason, the Company would ask the Board of Trade to make the Order in the form in which it had been submitted. There was no opposition from local authorities; and the names of the 40 objectors were in respect of 36 dwelling houses. There were 8 objections from occupiers, in cases in which the owners had already assented to the storage of gas; and this left 28 houses representing clear opposition. It was obvious that the substance of the objection was the appearance of the holder.

RETROSPECTIVE POWERS OF THE BOARD OF TRADE.

Mr. FORTUNE: What the Board of Trade are being asked to grant is an Order to enable the Company to erect storage for gas. The notice that was sent out was "to authorize the Company, on land herein mentioned, to erect a holder." That is in the future; and if, and so far as, these proceedings to-day are to ratify what has already been done, I want to say that my clients will certainly take the point that the Board of Trade have no power to grant an Order to ratify what has been done. If any Order was made here and now as the result of this inquiry, it would be to do an act in the future, and could have no relation to the holder that has been already put up. It would not have the effect of legalizing what my clients regard as a very high-handed piece of work. There may be proceedings hereafter in respect to what has been done; and my clients say that there is no power under section 10 of the Gas Regulation Act to legalize it.

Mr. ASKEW replied that the practice of the Board of Trade had repeatedly been to validate Acts done by gas undertakings.

GROWING GAS CONSUMPTION.

Mr. *Henry Burrows* said that he had been associated with the Company for sixteen years, as Secretary or General Manager. The Company had had no idea that there would be any opposition. They thought there could be no harm in putting up the holder on land suggested by the Council, as it was suitable in the opinion of their Consulting Engineer, Mr. Evetts. It was essential, to enable the Company to give a proper supply of gas at an adequate pressure, that they should have a holder in this town. As regards output in the Walton area, the gas sold showed a steady increase up to 1925, and then a very large increase in 1926, which was partly accounted for by the coal strike. This was followed by a slight decrease in 1927, owing to the bad season then experienced; but 1927 when compared with 1925 showed a very considerable rate of increase. The

new holder was of 100,000 c.ft. capacity; and the former storage was 50,000 c.ft.—that was ignoring the small holder, which was only used as a relief holder.

Cross-examined by Mr. FORTUNE, witness said he could not see that the holder was detrimental to the properties represented by the objectors. The Council suggested that they should place the holder on this site; and they had carried out the suggestion. They had asked the Council if they would agree to an extension for a further period of five years of the period within which the gas-works must be removed; and the Council had replied that they would, provided the existing holder was removed. The Council were then asked where the Company could put the new holder; and they offered the site at the electricity station. In these circumstances, the Company thought there would be no difficulty in obtaining sanction. The erection of the holder was commenced in September, 1927.

Mr. FORTUNE: Did your anxiety to get the holder erected, though you had secured an extension of five years within which to remove the old one, prevent you from sending out the ordinary applications for consent before the work was carried out? How far had the erection proceeded before you first thought of applying for consents?

Witness: It would have been about half completed by that time.

Is there any gas in it now, or has there ever been?—No.

What was the urgency that made you rush on with the work before applying for consents?—We were anxious to have the holder up, to meet the maximum demand in the season.

Was there anything to prevent you sending out applications for consent before starting the holder?—No; but we thought there would be no objections.

In reply to further questions by Mr. FORTUNE, witness said that the only reason for employing as their Solicitor the Clerk to the Council was that he knew the neighbourhood. It was quite true that, as a number of consents had not come in by the date named for them to be received, a man, who happened to be an ex-police constable, was engaged to go round and secure the answers. No doubt the Solicitor did this on the Company's instructions. He was asked to get in the consents.

Mr. FORTUNE: Why has nothing been done at Kirby towards the removal of the gas-works?

Witness: We have plenty of time.

You have done nothing towards that work, yet you rush up this holder in another place?—No one would spend capital before he was bound to.

I suggest it was quite well known that Walton would be taking electricity in bulk, and the idea was that, if one holder could be erected at the generating station, when the remainder of the site became available the Company might be able to put up the whole of their works there?—There would not be sufficient room on the site for this.

At any rate, was it not in contemplation that the Company should secure the remainder of the electricity station site?—We never thought of it for a moment; and we do not want it.

In re-examination, witness said a committee of his Company negotiated with a committee of the Council to extend by a further five years the period for the removal of the works. Mr. Nicholson had nothing to do with the Company until the agreement relating to the site for the new holder had been signed. He was first instructed when it was desired to get in the consents, because he was a Solicitor, and because he knew the neighbourhood. They had still three years within which to remove the works; and there was no object in carrying out the scheme before then. A siding had already been put down.

Mr. RONCA: An alternative site on the Marshes has been suggested for the holder which is the subject of this inquiry. Can you tell me the difference in level between that site and the one on which the holder has been erected?

Witness: I should say about 20 to 25 ft.

The parties then left with Mr. Ronca for an inspection of the gas-holder site; it being arranged that they should re-assemble later to hear the objectors.

INQUIRY AT LEEDS.

Application to Borrow £67,481 for Extensions.

A Leeds Corporation scheme for the construction of new workshops in New York Road, for purposes of the gas undertaking, formed the subject of an inquiry at the Town Hall on May 24, when Mr. J. Gardner, an Inspector appointed by the Minister of Health, heard an unopposed application to borrow £67,481.

The Deputy Town Clerk (Mr. O. A. Radley) explained the necessity for the loan sanction. After inspecting properties in various parts of the city, he said, the Committee decided to erect new workshops on the site now under consideration, which as to 4678 square yards belonged to the Improvements Committee, and as to 4120 square yards was purchased for £7000. The proposed scheme, Mr. Radley continued, would have the following advantages:

(1) More efficient control.
(2) Decreased transport charges.
(3) Centralization of stores.
(4) Avoidance of duplication of work.
(5) Owing to lack of accommodation a large number of meters had to be sent out to repair. In the new premises provision was to be made for more men to be employed for this work, thus effecting considerable saving.
(6) Greatly improved facilities for the loading of motor lorries and other vehicles.

The necessity for increased accommodation was shown by the great increase in the number of appliances dealt with by the Department.

Evidence in support of the application was given by Mr. C. S. Shapley (the Gas Engineer and General Manager), who, with the aid of a model of the proposed new works, explained the scheme in detail.

The Inspector, declaring the inquiry closed, intimated that, after inspecting the existing gas premises as well as the site, he would prepare a report for submission to the Minister.

BILSTON GAS COMPANY SEEK FURTHER POWERS.

Board of Trade Inquiry.

The Bilston Gas Light and Coke Company, having made an application for a Special Order under section 10 of the Gas Regulation Act, Mr. JAMES F. RONCA (Gas Administrator at the Board of Trade) attended at the Bilston Town Hall on Friday, June 8, to conduct an inquiry.

Clauses in the application included: To define or re-define the limits within which the Company is authorized to supply gas; to increase the borrowing powers of the Company, and to make provision with regard to the reserve fund of the Company.

Mr. JACQUES ABADY appeared for the Company, Mr. H. F. BIDDER for the Bilston Urban District Council, and Mr. H. ROYSTON ASKEW for the Town of Dudley Gas Light Company. The Chairman of the Bilston Council (Mr. W. M. Hughes) and other members of the Council attended; and the Coseley Urban District Council, who are interested in the application, were represented by the Chairman (Councillor F. Higgins) and the Clerk (Mr. J. C. Roper).

Mr. ABADY, opening the proceedings, said there had been a number of objections to the making of the Order. Objections by the Birmingham Canal Navigations had been withdrawn subject to the Gas Company inserting in the Order, with the consent of the Board, one proviso to one clause. Then the insertion of certain clauses or provisos had been asked for by the Great Western Railway Company, and the London, Midland, and Scottish Railway Company; and those two had been settled in a like manner, subject, of course, to the consent of the Board. Then the Coseley Urban District Council sent a formal objection contained in a letter dated April 4, on the ground that, in view of the elections, they had not had the opportunity of fully considering the matter. Mr. Abady added that this did not seem to be a very valid objection.

Mr. ROPER: We are not pursuing the objection.

Mr. ABADY, dealing with the objection of the Bilston District Council, said that the Gas Company considered that the Council were only doing their duty in protecting the interests of the ratepayers and consumers. The Company and the Council had met, and as a result of the meeting and an extensive knowledge of what was reasonable and fair in connection with gas undertakings, he was happy to be able to state that an agreement had been arrived at under which the Council would not pursue their objections.

Mr. BIDDER referred to the question of fixed prices, for which the Bilston Council were contending.

Mr. RONCA said he would like the parties to consider the point of fixed prices, or whether they should come under section 1.

Mr. ABADY said he did not agree with fixed prices. He thought there would be a difficulty of fixing prices in a Special Order. The machinery for the provision of prices was in section 1; and while he considered it was immaterial whether the prices were subject to the provision of this section or not, he did not think the Board of Trade had any power to refuse an application under section 1 or prevent a local authority from applying in circumstances which they thought justified. If the Board considered they had the power, and cared to take the risk, he was willing that a clause should be inserted that the standard price of gas of 15·4d. per therm should read 11·6d. per therm.

With regard to the capital powers of the Company, showing capital raised, authorized, and remaining to be issued, the last item was very small, being only £7676, including premiums. They had £8000 for loan powers, and they were asking for this to be raised so as to increase one-half of the capital powers. This in effect was an increase in the borrowing powers of £25,500. The Bilston Council, for reasons on which he did not want to comment, were anxious that before the Company exercised the unexercised powers of issuing new shares, they should raise their further capital by loan. The Company thought that possibly this might be embarrassing, but they were willing to agree to exercise their further capital powers which would be granted them if the Order were passed by issuing loan capital before they issued further share capital except with the consent of the Bilston Council.

Mr. BIDDER referred to the amendment of charges dealing with prepayment meters.

Mr. ABADY stated that, in common with the practice of most other companies in the neighbourhood, prepayment meters were set at a higher figure, and the consumers got a rebate.

Mr. BIDDER observed that, subject to what his friend had said, the Bilston Council agreed to the passing of the Order.

The next discussion had reference to a piece of land which Mr. ABADY urged was within the Parish of Coseley, and within the limits of the Bilston Gas Company, and which, on the other hand, was stated to have been purchased by the Dudley Corporation. The land in question had always been co-terminous with the Coseley District; and he submitted that the Bilston Company were responsible for the supply.

Mr. ASKEW (for the Dudley Gas Company) said the Order for which application was being made was designed to take from the Dudley Company an area over which they had rights, and annex to the Bilston Gas Company an area over which they had no rights. The area had recently been bought by the Dudley Corporation, and it would be developed for building purposes, quite apart from the Dudley Corporation Bill.

A discussion upon the relative competence of the two Gas Companies to serve the area was ruled to be irrelevant.

Continuing his arguments, Mr. ASKEW said the area was in a peculiar Parliamentary position, and he urged that Dudley could look forward to the right of supply. The area was miles nearer the Dudley Gas-Works than the Bilston Gas-Works.

The inquiry then closed.

CITY AND GUILDS OF LONDON INSTITUTE.

The following questions were set in the City and Guilds of London Institute Examinations in the subjects named.

GASFITTING.

GRADE I.

(Not more than six questions to be attempted. The maximum number of marks obtainable is affixed to each question.)

1. Give a sketch showing the way in which you would connect a **U**-tube pressure gauge to test a carcass for soundness, and state at what pressure this test should be carried out. (*30.*)

2. Describe the action of a dry meter, and give sketches to illustrate your answer. (*30.*)

3. (*a*) Give a sketch showing the connections to a 20-light dry meter where the gas service falls towards the meter position.
(*b*) Give the sizes of the meter connections for a 5-light, 10-light, and 20-light meter. (*30.*)

4. Give a list of the tools necessary for fixing a gas fire and a gas cooker to existing gas points. What fittings would be necessary if the cooker point was ¾-in. diameter, the cooker float ½-in. diameter, and the gas fire point and fire connection were each ¼-in. diameter? (*30.*)

5. What are the capacities in (*a*) cubic feet and (*b*) gallons of a cylinder 3 ft. in height and 2 ft. 3 in. in diameter, and of a rectangular tank 3 ft. by 2 ft. 6 in. by 1 ft. 9 in.? (*30.*)

6. Fig. 1 (not reproduced here) shows three meter readings, A, B, and C. Reading A was taken on March 1, reading B on June 1, and reading C on Sept. 1. Give the readings on each of these dates, and give the consumption in cubic feet for June and September quarters. (*30.*)

7. What are (*a*) a British thermal unit and (*b*) a therm?
Convert the following consumptions in cubic feet to therms, and give the cost in each case at 9·6d. per therm.
10,000 c.ft. of 550 B.Th.U. gas.
10,000 ,, ,, 500 ,, ,, (*30.*)

8. Give the consumption in cubic feet per hour (500 B.Th.U. gas) of the following:
(*a*) 7-radiant gas fire.
(*b*) 12-radiant gas fire.
(*c*) Large inverted burner.
(*d*) Upright incandescent burner.
(*e*) An outside lamp fitted with 5 medium mantles on a superheater.
(*f*) The pilot light of a large inverted burner. (*30.*)

9. Give a sketch in section of a piece of lead piping that has been bent to form half a circle, and describe the effect that the bending has produced on the thickness of the lead at various points. (*30.*)

GRADE II.—WRITTEN PAPER.

(Not more than six questions to be attempted.)

1. Give a definition of gas pressure, and explain its origin. Sketch a 6-in. **U**-gauge showing a pressure of 38 tenths water column and a 6-in. **U**-gauge filled with mercury showing a pressure equivalent to 81 in. water column. What are the equivalents of 4½ lbs. per sq. in. in inches water column and inches mercury column? (*30.*)

2. Describe in detail how you would use a pressure gauge in order to determine:
(*a*) Whether a bad supply to an appliance was due to a partial stoppage in the supply pipe, or to the supply pipe being too small.
(*b*) Whether the carcass was sound.
(*c*) The pressure drop caused by a dry meter. (*30.*)

3. Show by a sketch the method of fixing a 200-light meter with a by-pass and the necessary control valves. Mark on the sketch the over-all dimensions of the meter and the size of the connections. (*30.*)

4. What are the causes of the following defects in dry gas meters?
(*a*) Passing unregistered gas.
(*b*) Noise.
(*c*) Oscillation.
(*d*) Leaky index.
How would you deal with each of these defects? (*30.*)

5. Give sketches showing two methods adopted for the ventilation of the ovens of gas cooking stoves. What are the common defects in gas ovens, and what are the remedies? If you were instructed to fix a flue pipe from the outlet of a gas oven, what precautions would you take to ensure that the oven efficiency is maintained, and where would you terminate the flue pipe? (*30.*)

6. What is the difference between radiant heat and convective heat? Name three types of gas heating appliances, and state in each case whether they warm by radiant or convective heat, or by both. (*30.*)

7. State in detail how you would carry out the following work, and give sketches to illustrate your answer:
Insert a tee on a ¾-in. supply running beneath floor boards, and extend a distance of 15 ft., and fix a 12½-in. gas fire. State the size of the supply pipe you would fix.
What tests would you apply to ensure the work being left in a satisfactory condition? (*30.*)

8. Give a sketch of a gas heated cylinder system of hot water installation suitable for supplying a bath and two basins. Give the sizes and names of the pipes, the size of the hot water storage necessary, and the consumption, in cubic feet per hour, of a suitable circulator. (*30.*)

9. (*a*) Give a sketch showing a method for ventilating a geyser, and state the best position in which to fix a baffler.
(*b*) Sketch a baffler and a terminal in section. (*30.*)

GRADE II.—PRACTICAL EXAMINATION.

(Candidates must attempt all questions.)

1. With the materials provided make up the 1-in. diameter meter connection to the dimensions shown in fig. 1. (*1¼ hours; 55 marks.*)

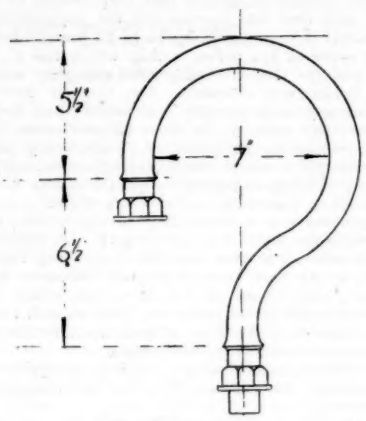


Fig. 1 (Grade II).

2. Make a rectangle in ½-in. diameter iron tubing to the dimensions shown in fig. 2, leaving a ¼-in. centre tee piece for testing

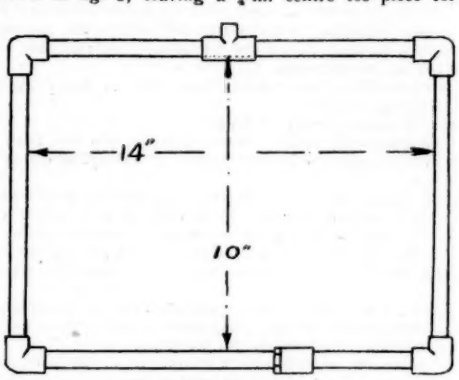


Fig. 2 (Grade II).

purposes. Test for soundness with **U**-tube pressure gauge. (*1 hour; 55 marks.*)

3. Examine the dry gas meter and answer questions put to you by the examiner. (*¼ hour; 15 marks.*)

4. Connect the gas supply to the fire with ½-in. brass tubing set over the curb to the ¼-in. control cock provided. Regulate the burner of the fire and leave it in good working order. (*1 hour; 45 marks.*)

5. Regulate the three incandescent burners fitted on the rail, and answer the questions put to you by the examiner. (*¼ hour; 15 marks.*)

6. Fit and adjust the burners of the cooking stove hotplate and oven, and answer the question put to you by the examiner. (*¼ hour; 15 marks.*)

FINAL EXAMINATION.—WRITTEN PAPER.

(Not more than six questions to be attempted.)

1. What are the common defects associated with gas service pipes? How would you deal with them in order to effect a permanent remedy? (*30.*)

2. In what circumstances is it thought desirable to test a consumer's meter *in situ*? Explain in detail how you would proceed to test for accuracy of registration a 10-light dry meter in this way. (*30.*)

3. How would you proceed to exchange a 200-light meter that was by-passed, and what precautions would you take before advising the consumer that the work was completed? (*30.*)

4. Give sketches of two methods of securing outside lamp arms to shop facias in order to ensure a sound fixing. (*30.*)

5. Describe a method of distance control of an installation of six inside lamps from one control point. Give a rough sketch of the pipe runs in each case, and describe the distance control devices that you would use. (*30.*)

6. What tests would you apply to ensure that a geyser you had just fitted was left in a satisfactory condition? (*30.*)

7. What is meant by "pressure drop," and what information can be obtained from the "pressure drop" in a gas installation? What "pressure drop" would you expect to result from the following?
(*a*) A 50-light meter working at normal speed.
(*b*) A 60-ft. length of ¾-in. diameter tubing supplying a cooking stove consuming 100 c.ft. of gas per hour. (*30.*)

8. You are instructed to arrange for the laying-on of a gas service over a distance of 35 ft. to the meter position, fixing a meter, and extending a supply from the meter outlet for a distance of 50 ft. to supply two double-oven cooking ranges (with front floats) fitted back to back. State:
(*a*) The diameter of the service pipe.
(*b*) The size of the meter.
(*c*) The size of the meter connections.
(*d*) The size of the supply pipe from the meter to the cookers.
Give a rough sketch showing, in plan, the manner in which you would connect the gas supply to the floats of the cookers. (*30.*)

9. State in detail how you would proceed to inspect and overhaul the following appliances:
(*a*) A gas fire.
(*b*) A gas cooking stove.
(*c*) A domestic wash-copper. (*30.*)

FINAL EXAMINATION.—PRACTICAL TESTS.

(*Candidates must attempt all questions.*)

1. With the materials provided make up the 1¼-in. meter connection with ¾-in. saddle joint to the shape and dimensions shown in fig. 1. (*1½ hours; 60 marks.*)

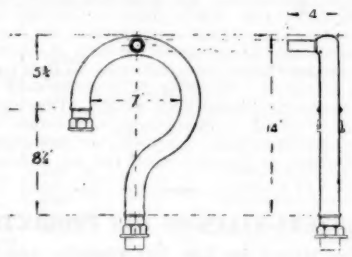


Fig. 1 (Final).

2. Set a length of 1-in. diameter tubing to form a double set to fit into a recess as shown in fig. 2. Cut and screw set piece and short

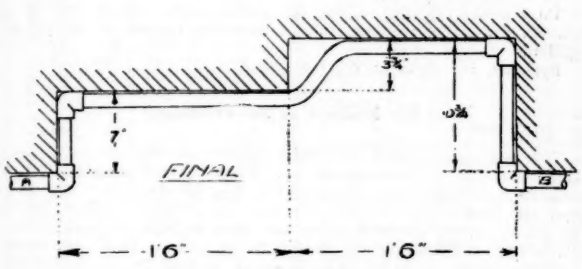


Fig. 2 (Final).

pieces, and fit four elbows as shown. Extension pieces A and B are not to be fitted; an open elbow to be left on each end. (*1½ hours; 60 marks.*)

3. Examine the automatic dry meter, and answer the questions put to you by the examiner. (*¼ hour; 20 marks.*)

4. Examine the hot water set, and answer the questions put to you by the examiner. (*¼ hour; 20 marks.*)

5. Connect the gas supply from the ¼-in. point provided to the gas-heated steam radiator with the materials provided, and adjust and leave the radiator in good working order. Answer the questions put to you by the examiner. (*¾ hour; 40 marks.*)

MINOR COURSE IN GAS SUPPLY PRACTICE.

(*Not more than eight questions to be attempted. The maximum number of marks obtainable is the same for each question.*)

1. A pipe 6 in. in diameter and 1000 yards long is found to deliver 2500 c.ft. of gas per hour with a loss of pressure of two-tenths of an inch head of water. There are no connections *en route*, and the main is level. It is proposed to insert a branch near to the end of the main to supply an additional demand of 2500 c.ft. of gas per hour. What will be the resultant loss of pressure in the 6-in. main?

2. The branch named in the preceding question is to be 4 in. in internal diameter, and is to be inserted during a period of two hours when the consumption is less than 400 c.ft. per hour, and in such a way as not to inconvenience consumers. Describe carefully (with a sketch) the method you would recommend for the carrying out of the work, stating the order of procedure and the tools and material required. The main may be supposed to be of either cast iron or steel.

3. Describe fully the method of laying a service from a 6-in. main to a 5-light meter, including the fixing of the meter. The answer should be illustrated by sketches, and should mention all tools and materials required.

4. Describe with a sketch the construction of a dry gas meter. What defects in its parts are liable to cause faulty registration?

5. If you were inspecting the carcassing of a house to see that the whole was completed in a thoroughly satisfactory manner, before fixing the meter, to what points would your attention be directed, and how would you test the soundness of the installation? Give reasons for each item of your answer.

6. Describe briefly the general principles of the manufacture of an incandescent mantle, so as to explain the ultimate constitution of the mantle and the precautions needed in subsequent handling.

7. Sketch and describe the construction of an inverted gas burner suitable for use in a street lantern, and giving an illumination of 100 candles.

8. Sketch a burner suitable for a gas fire having ten upright radiants. Explain the reason for the provision and construction of each part of the burner.

9. Describe with a sketch the internal construction of one form of geyser suitable for supplying hot water for a bath.

10. Describe briefly the sequence of events in the cylinder of a gas engine working on the Otto cycle. Sketch the form of an indicator diagram taken when the engine is working correctly.

MINOR COURSE IN GAS-WORKS PRACTICE.

FIRST PAPER.

(*Not more than six questions to be attempted. The maximum number of marks obtainable is the same for each question.*)

1. What are the general principles of gaseous firing as applied to a setting of horizontal retorts, and how would you proceed to bring a cold setting to working temperature?

2. Discuss the uses of blue and carburetted water gas plants.

3. Describe the general arrangement of a set of six purifiers and a system of working backward rotation.

4. How would you prepare a Lancashire boiler for the annual visit of the boiler inspector?

5. Show by the aid of sketches the construction of a safety governor, and its application to gasholder connections.

6. Describe the chemical reactions of oxide purification and the testing of spent oxide.

7. How would you ascertain the comparative value of different coals for gas making?

8. Describe the manufacture of dry neutral sulphate of ammonia.

COKE AND BYE-PRODUCTS MANUFACTURE.

FINAL EXAMINATION.

(*Not more than eight questions to be attempted.*)

1. Describe and dicuss the dewatering of washed coking coal. (*35.*)

2. Write a short essay dealing with one of the following:
(*a*) The dry cleaning of small coal.
(*b*) The manufacture and preparation of coke for specific markets.
(*c*) The utilization of surplus coke oven gas, (*45.*)

3. Sketch and discuss a *modern* type of regenerative coke oven. (*40.*)

4. Write an account (with sketches) of an up-to-date coal preparation and charging equipment. (*45.*)

5. Describe a suitable liming apparatus for treating 150 tons daily of ammonia liquor containing 0·3 p.ct. "fixed" ammonia.
What quantity of lime would you provide to meet the requirements of this plant? (*35.*)

6. Sketch, with explanatory matter, one of the following:
(*a*) A tar extractor.
(*b*) A mechanical washer scrubber.
(*c*) A Carr disintegrator. (*35.*)

7. Describe the rectification of crude benzole for motor fuel, and give a specification of this product. (*35.*)

8. State how you would carry out the following estimations:
either, 1. (*a*) Sulphuretted hydrogen in crude gas.
(*b*) Phosphorus in coke.
or 2. (*a*) Volatile matter in coal.
(*b*) Naphthalene in crude gas.
Answer either 1 (*a*) and (*b*) or 2 (*a*) and (*b*). (*40.*)

9. Illustrate and explain the various types of apparatus employed in moving liquids on a coke and bye-product works. (*40.*)

10. Explain fully how you would start up a modern battery of regenerative ovens built of silica material. (*40.*)

COAL-TAR DISTILLATION AND CRUDE INTERMEDIATE PRODUCTS.

FINAL EXAMINATION.—WRITTEN PAPER.

(*Not more than six questions to be attempted. The maximum number of marks obtainable is the same for each question.*)

1. State the methods you would adopt to judge the beginning of the different fractions taken during the distillation of tar to pitch.
What effect, if any, would a change from crude horizontal retort tar to crude vertical retort tar have upon your methods?

2. Give a brief account of the methods adopted to extinguish fires on tar and benzole distillation works.

3. Road tar specifications usually include clauses limiting the percentages of naphthalene, tar acids, and free carbon present in the product. Give reasons for this.

4. What are the underlying principles controlling the operation of a modern fractionating column? What is the function of the reflux condenser, when employed?
Illustrate your answer by the method employed to obtain pure toluole from 90's toluole.

5. Write short essays upon two recent improvements in the plant or processes employed upon tar and tar products works.

6. Describe the process you would adopt for the manufacture of naphthalene-free cresylic acid.
What impurities will be present in the final product?

7. Give a short but careful account of *two* of the following tests, and point out the precautions necessary in order to obtain consistent results: (*a*) The valuation of 60's carbolic acid; (*b*) the estimation of the neutral oil content of a sample of cresylic acid; (*c*) the estimation of paraffin hydrocarbons in a sample of motor spirit; (*d*) the estimation of thiophene in benzole.

8. Give a specification for creosote oil suitable for preserving timber and describe a method of using the oil for this purpose.

9. Write an account of the process of manufacturing *either*
(*a*) 880 liquid ammonia from gas liquor; *or*
(*b*) sulphate of ammonia without the employment of sulphuric acid.

COAL-TAR DISTILLATION AND CRUDE INTERMEDIATE PRODUCTS.

FINAL EXAMINATION.—PRACTICAL TEST.

1. Test the sample of pyridine bases marked A, and state your opinion of its quality.

2. What is sample B? Examine it in the usual way, and report upon its quality.

3. Report upon the sample of sulphate marked C. Calculate the percentage purity of the sample.

4. (*a*) Identify sample D, and record your qualitative tests.
(*b*) Determine the crystallizing point and tar acids content of the sample of crude naphthalene marked E.

TRADE NOTES.

Safe Bathroom Geysers.

A great amount of study is being given to ensure that geysers and water boilers will be fixed and used with safety. In this direction much valuable work has been done by the well-known firm of metal workers and engineers, Messrs. T. S. Hall, Southville Works, Southville, and 62 and 63, Thomas Street, Bristol. Mr. T. S. Hall has been making an intensive study of the safe use of the modern geyser, and, by the introduction of some specialities in ventilating appliances, has made definite progress in the direction of the "safe bathroom." Mr. Hall's ventilating fittings comprise a galvanized hood for fixing over the geyser, for the purpose of collecting any fumes and to aid up-draught through the outlet pipes provided. Then there is a specially constructed baffler, which assists up-draught and prevents back-draught. There is also a patent cowl, known as the "Roventa," which prevents back-draught, and in conjunction with the baffler makes for double security. These fittings have been subjected to severe tests, which prove that proper ventilation can be effected by the use of the right appliances, and the dangers associated with back-draught obviated.

"W-D" Intermittent Vertical Chamber Ovens.

There has been published by the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., an illustrated brochure of thirty-one pages describing in considerable detail their system of intermittent vertical chambers. The firm realize that it is not practicable to provide one standard type of carbonizing plant which will give the most efficient results in all circumstances. Local conditions affect the economics of the producing plant. For example, the saving in the purchase of cheap slacks from nearby collieries may outweigh better carbonizing results from superior coals; it may not be possible to sell all the coke produced locally, and a hard coke may be required for shipment. The Woodall-Duckham Companies have therefore placed themselves in a position to offer other forms of carbonizing plant as alternatives to "W.-D." continuous verticals. The "W.-D" intermittent vertical chamber is a development of the Dessau retort, which has been modified by having one chamber in place of two or three small retorts, by employing silica, and by improvement in the retort fittings and mechanical gear. Set out in the booklet are the following "distinctive features of 'W-D' intermittent vertical chambers.": Sound construction, simple operation, low labour costs, low maintenance costs, high thermal yield of gas per ton of coal, capability of carbonizing cheap slacks or blends, flexibility of gas output and calorific value, and high-quality coke from low-quality coals.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

The past week has been most disappointingly dull in the market, and the hopes recently entertained of better trade have been severely damped. Business all round seems to have gone off again, and idle time has been common. Collieries are still adhering to the policy of not reducing prices; but in face of severe competition from other exporting districts as well as continental rivals, the principle appears likely in the near future to be severely tested.

There is a general shortage of prompt trade, and inquiry for forward positions is very slow. Quotations are generally unchanged. Gas coals are quiet, and in need of trade. Wear Specials ask 15s. 6d., and best qualities 15s. f.o.b. Others are 13s. 3d. to 13s. 9d. Coking coals are fairly well sold, and 13s. 6d. to 13s. 9d. is steadily quoted. Bunkers offer freely; best makes at about 14s. 6d., and others 13s. 3d. to 13s. 6d. Northumberlands continue to ask the agreed minimum prices; but the outlook for trade is poor.

There has been considerable activity in some coke descriptions; foundry makes being in special demand. Gas sorts are quiet for prompt, and worth about 19s. to 19s. 6d. f.o.b. for shipment. There is, however, good inquiry for later periods, and 21s. to 22s. is indicated for August onward.

YORKSHIRE AND LANCASHIRE.

Gas coals are moving easily against contracts, and there is an indication of increased figures for the future.

Industrial fuel of the better grades remains firm. With the continued decreases in output some qualities of coking coals are in good demand.

Domestic coal is not in great request, and prices are ruling easy. Export prices also are easy.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports:

South Yorkshire—Hards, Association, bunkers 16s. 9d. to 17s., export 14s. to 14s. 3d.; screened gas coal, export 14s. 6d. to 15s.; washed trebles, 14s. 9d. to 15s. 3d.; washed doubles, 14s. to 14s. 3d.; washed singles, 12s. 3d. to 12s. 6d. and 13s. 6d.; washed smalls, 9s. 9d. to 10s. export; rough slacks, 11s. 6d. to 11s. 9d. bunkers; smithy peas, 16s. 6d. to 17s. 6d. export.

West Yorkshire—Hartley's (f.o.b. Goole), 13s. 9d. to 14s. export; washed trebles, 14s. 6d.; washed doubles, 13s. 6d. to 13s. 9d.; washed singles, 13s. 3d. to 13s. 6d.; washed smalls, 10s.; unwashed trebles, 14s. to 14s. 6d.; unwashed doubles, 10s. 6d. to 11s.; rough slack, 9s.; coking smalls, 7s. 9d. to 8s 6d. export.

Derbyshire and Nottinghamshire—Top hards 16s. 6d. to 17s. bunkers, and 14s. to 15s. export; washed trebles, 15s. export.; washed smalls, 12s. 3d. to 12s. 6d. bunkers, and 10s. export; unwashed doubles, 10s. 6d. to 11s. 6d. export; rough slack, 11s. to 11s. 6d. and 9s. to 9s. 6d. respectively.

Yorkshire, Derbyshire, Nottinghamshire—Screened steam coal, 14s. 6d. to 15s. 6d. bunkers, 12s. to 13s. export; gas coke, 21s, to 23s. export; furnace coke, 18s 6d. to 19s. export; washed steam, 15s. 3d. to 15s. 6d. bunkers, all per ton,

MIDLANDS.

The working of the pits is very irregular; but those which are outside the Five Counties Scheme continue to make better time than affiliated properties. Some of the Cannock collieries which made a not very successful attempt to raise their prices by 1s. 6d. at the beginning of May have sent out an announcement that till further notice prices will be 1s. a ton below the May level. Actually, the position is very much what it was in April.

While unassociated collieries are getting a larger share of current business than they got prior to the launching of the control, market pressure is not such as to enable them to improve on the former prices. As they are in many cases working four and five days a week, they have a considerable advantage in the ratio of overheads.

Buyers of some descriptions of smalls have to look round for alternative sources of supply. There is no real difficulty in satisfying requirements, however. Slacks keep steady. They can still be obtained at 6s. 6d. to 7s. 6d. at the pithead, with rather more for good rough grades. Spot lots are not unknown; but they are comparatively rare. Furnace cokes are plentiful round 12s. 6d. at ovens.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *June* 11.

There is little of interest to report in the tar products market. Values generally are as follows:

Pitch, 65s. per ton.

Creosote, 8¼d. per gallon.

Pure benzole, about 1s. 8d. per gallon; pure toluole, 2s. 1d. to 2s. 2d. per gallon; 95/160 solvent naphtha, 1s. 6d. to 1s. 7d. per gallon.

Pyridine, 5s. 3d. to 5s. 6d. per gallon.

Tar Products in the Provinces.

June 11.

The average prices of gas-works products during the week were: Gas-works tar, 43s. 3d. to 48s. 3d. Pitch—East Coast, 62s. 6d. to 65s. f.o.b. West Coast—Manchester, 55s. to 57s. 6d.; Liverpool, 57s. 6d. to 60s.; Clyde, 60s. to 62s. 6d. Toluole, naked, North, 1s. 5d. to 1s. 6d. nominal. Coal-tar crude naphtha, in bulk, North, 8d. to 8½d. Solvent naphtha, naked, North, 1s. 1½d. to 1s. 2d. Heavy naphtha, North, 1s. to 1s. 0½d. Creosote, in bulk, North, liquid, 6⅜d. to 6½d.; salty, 6¼d. to 6½d.; Scotland, 6½d. to 6½d. Heavy oils, in bulk, North, 8½d. to 8¾d. Carbolic acid, 60 p.ct. 2s. 3d. to 2s. 4d. prompt. Naphthalene, £13 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Benzole Prices.

The following are considered to be the market prices to-day:

Crude benzole	s. d.	s. d.	
Motor	0 10½	to 0 11	per gallon at works
90 p.ct.	1 4½	„ 1 5	„ „ „
Pure	1 7	„ 1 8	„ „ „
	1 10	„ 1 11	„ „ „

CONTRACTS OPEN.

Coal.

The Wigan Gas Department invite tenders for the supply of coal. [See advert. on p. 740.]

The Gas Committee of the Marple Urban District Council invite tenders for the supply of coal. [See advert. on p. 740.]

Dewsbury Town Council Compliments Gas Manager.—The Dewsbury Gas Committee were congratulated by the Town Council, on June 7, on wiping out a deficit which four years ago was as much as £52,000. The deficit had been finally effaced by a net profit of £10,306 for the year ended March 31 last. In addition, the Committee had been able to reduce the price of coke for manufacturing purposes from 20s. to 16s. 6d. per ton, and proportionately for domestic supplies in bags. Alderman McCann, the Chairman of the Gas Committee, warmly complimented Mr. H. L. Bateman, the Engineer and General Manager, on the results; and the Council agreed that the congratulations should be recorded on the minutes.

Meters Limited.—The report of the Directors for the year ended March 31 states that, after deducting the interim dividends, there is an amount available for appropriation of £26,371. As to this, they recommend as follows: The payment of final dividends of 2¾ p.ct. (actual) upon the preference shares and of 6½ p.ct. (actual) upon the ordinary shares, making the total dividends for the year 5½ p.ct. upon the preference shares and 9 p.ct. upon the ordinary shares (both less income-tax). That the sum of £5000 be added to the reserve fund (making that fund £125,000). That £3299 be added to the staff benevolent fund (making that fund £10,000). That the balance of £4489 be carried forward. The Directors report with deep regret the loss by death in November last of their esteemed colleague Mr. Thomas A. Orme, who had been a very valued member of the Board since 1912. Messrs. Luke B. Taylor, Joseph Morley, Frederick O. Manning, and Thomas C. Braddock (all of whom have been in the service of the Company for a considerable time) were elected Directors as from Jan. 1, 1928.

News Items Continued on p. 736.

STOCK MARKET REPORT.

THE volume of business transacted on the Stock Exchange last week was comparatively small. There was little stock available, and quotations suffered in consequence. Arrangements were made for the new Norwich and Doncaster Corporations 4½ p.ct. loans, the former to be offered at 99½ and the latter at 99. Both issues are expected to be successful. Gilt-edged stocks maintained their prices, particularly Funding Loan, which advanced to 90⅜. With the exception, however, of a few Industrial specialities markets generally were very subdued.

There were no outstanding features in the Gas Market last week. Prices remained steady, and, as will be seen from the Table, there were few changes in the quotations. The Plymouth and Stonehouse Company's accounts were received during the week, and disclose satisfactory results. The Directors recommend final dividends of £7 17s. 6d. p.ct. per annum on the ordinary stock (against £7 12s. 6d. for the corresponding period last year), 13s. 3d. per share on the additional shares (against 12s. 9d.), and 12s. 9d. per share on the new shares (against 12s. 3d.).

The following transactions were recorded during the week:

On Monday, Alliance and Dublin 94⅝, Brighton 6 p.ct. 117½, Continental Union 36, European 8½, 8⅝, Gas Light and Coke 18s. 7½d., 18s. 9d., 18s. 9¾d., 18s. 10¼d., 3½ p.ct. maximum 63¾, 64, 4 p.ct. preference 79½, 3 p.ct. debenture 60⅜, 61, 61½, Imperial Continental 164, 164½, 165, 165½, Newcastle 3½ p.ct. debenture 66¾, Primitiva 26s., 26s. 4½d., 26s. 6d., South Metropolitan 105⅝, 106¼, 6½ p.ct. debenture 101½, South Suburban 5 p.ct. debenture 96½, Tottenham "B" 95, 95½. Supplementary prices, Gosport 6 p.ct. debenture 104, 104½, Redhill 7⅛ p.ct. debenture 101, 101½, Southgate and District 7 p.ct. maximum 106½, Tottenham 5 p.ct. 99½ (iss. at 96½ partly-paid), 3s. 2½d. pm.

On Tuesday, Aldershot 76½, Alliance and Dublin 94, Brighton and Hove 6 p.ct. 118½, British 7 p.ct. preference 115¼, 116¼, Commercial 99½, Continental Union 34½, European £8 9s. 8½d., Gas Light and Coke 18s. 7½d., 18s. 8¼d., 18s. 9d., 18s. 9¾d., 18s. 10½d., 3½ p.ct. maximum 64, 3 p.ct. debenture 61, Imperial Continental 163, 164½, 165½, Liverpool 7 p.ct. preference 101½, 101⅝, 102, Primitiva 26s. 4½d., 26s. 6d., South Metropolitan 106½, South Suburban 106½. Supplementary prices, Croydon 6 p.ct. debenture 103, Southend-on-Sea 4 p.ct. debenture 76½.

On Wednesday, Aldershot 77, Bombay 22s. 3d., Continental Union 34, Gas Light and Coke 18s. 7½d., 18s. 9d., 18s. 9¾d., 18s. 10½d., 4 p.ct. preference 79, Imperial Continental 164, 165, 3½ p.ct. debenture 69, Liverpool 7 p.ct. preference 101½, Primitiva 26s. 1½d., 26s. 3d., 26s. 4½d., South Metropolitan 106, 106½, 106¼, 106½, South Suburban 5 p.ct. 106½, 107½, Uxbridge 5 p.ct. preference 87½. Supplementary prices, Harrogate 5 p.ct. debenture 94⅜, 95½, Hartlepool 5 p.ct. debenture 99, Southgate and District 7 p.ct. maximum 108, Tottenham 5 p.ct. reg. 99, Wandsworth 5 p.ct. debenture 100⅜.

On Thursday, Aldershot "C" 77½, Alliance and Dublin 94½, Bombay 22s. 3d., 22s. 4½d., Bournemouth 5 p.ct. 12¼, 13, Brighton and Hove 6 p.ct. 118½, British 115, Continental Union 35, European 8⅜, 8 9/16, Gas Light and Coke 18s. 7½d., 18s. 9d., 18s. 9¾d., 18s. 10½d., 3½ p.ct. maximum 64⅜, 6 p.ct. debenture 103½, 5 p.ct. debenture 100½, Imperial Continental 165, 165½, 166½, Liverpool 7 p.ct. preference 102, Primitiva 26s. 3d., 26s. 4½d., 26s. 6d., 26s. 7½d., South Metropolitan 105⅞, 106, 106½, 6½ p.ct. debenture 102, South Suburban 5 p.ct. 107½. Supplementary prices, Brighton and Hove 6 p.ct. "B" preference 108½, Canterbury "B" 133, Hartlepool 5 p.ct. debenture 99, Liverpool 5 p.ct. 92½, Redhill 5½ p.ct. preference 100, Tottenham 5 p.ct. (iss. 96½ partly-paid) 2½, 2¼ pm., Uxbridge 4 p.ct. debenture 75½. Wandsworth 5 p.ct. debenture 100⅜.

On Friday, Alliance and Dublin 95, Bristol 88, British 115½, Commercial 99½, European 8 7/16, Gas Light and Coke 18s. 8¼d., 18s. 9¾d., 18s. 10½d., 4 p.ct. preference 79, Imperial Continental 165, Montevideo 94, 94½, Newcastle 3½ p.ct. 16s. 7½d., 16s. 9d., Primitiva 26s. 3d., 26s. 6d., 4 p.ct. debenture 77⅛, South African 5 1/32, South Metropolitan 106, 107, South Suburban 107½. Supplementary prices, Grays and Tilbury new 5 p.ct. debenture 98½, Reading 5 p.ct. 85, South Shields new 7 p.ct. 112.

The Money Market remained under the influence of the War Loan interest payments. There were ample funds available; and 3 p.ct. was accepted for renewals of old day-to-day loans, while new business ranged down to below 2 p.ct. As was to be expected, the Government were able to borrow more cheaply, and Treasury Bills were allotted at an average rate of £3 15s. 1·45d. p.ct., or just over 1s. 6d. p.ct. below the previous week's rate.

On the Foreign Exchange Market there were no changes of importance. The New York rate showed a decline of 3/32 c. to 4.88 7/32; Belgas finished at 34.95¾; pesetas showed a slight recovery at 29.31; Dutch florins were a trifle dearer at 12.09½; while the Paris and Milan rates were unchanged at 124.10 and 92.70 respectively.

Silver declined to 27½d. per oz. on Chinese sales, and Gold remained at 84s. 10½d. per oz.

The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct. on April 21, 1927. The Banks' deposit rate is 2½ p.ct., and the deposit rates of the discount houses are 2¼ p.ct. at call and 2¾ p.ct. at notice.

Issue.	Share.	When ex-Dividend	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. June 8	Rise or Fall on Week.	Transaction Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Feb. 9	5	5	Aldershot 5 p.c. max. C.	74–79	+2	76½–77½
412,992	,,	,,	4	4	Do. 4 p.c. Pref.	69–72	..	
1,551,868	,,	Apl. 12	7	7	Alliance & Dublin Ord.	93–96	..	94–95
374,000	,,	Jan. 12	4	4	Do. 4 p.c. Deb.	64–67	..	
522,654	,,	Mar. 8	7	7	Barnet Ord. 7 p.c.	109–112	..	
300,000	1	Apl. 26	1/7½	1/7½	Bombay, Ltd.	21/–22/-	..	22/3–22/4½
170,000	10	Mar. 8	8½	8½	Bournemouth 5 p.c.	12½–13½	..	12½–13
500,050	10	,,	7	7	Do. B 7 p.c.	12–12½	..	
375,000	10	,,	6	6	Do. Pref. 6 p.c.	10½–11	..	
50,000	Stk.	Jan. 12	8	8	Do. 8 p.c. Deb.	56–59	..	
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	76–79	..	
357,900	,,	Mar. 8	7½	7½	Brighton & Hove 6 p.c. Con.	116–119	..	117½–118½
341,880	,,	,,	6/8/6½	6½	Do. 5 p.c. Con.	103–106	..	
1,287,500	,,	Feb. 23	5	5	Bristol 5 p.c. max.	88–89a	+½	
855,000	,,	Mar. 22	8	7	British Ord.	113–116	..	115–115½
100,000	,,	Dec. 22	7	7	Do. 7 p.c. Pref.	114–117	..	115½–116½
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	73–76	..	
200,000	,,	,,	—	33/2	Do. 5 p.c. Red. Deb.	95–98	..	
100,000	10	May 24	6	8	Cape Town, Ltd.	7½–8½*	..	
100,000	10	Apl 26	4½	4½	Do. 4½ p.c. Pref.	6½–7½	..	
150,000	Stk.	Dec. 22	4½	4½	Do. 4½ p.c. Deb.	72–77	..	
626,860	,,	Feb. 23	6	6	Cardiff Con. Ord.	98–101	..	
287,860	,,	Jan. 12	7½	7½	Do. 7½ p.c. Red. Deb.	101–104	..	
157,150	,,	Feb 23	5	6½	Chester 5 p.c. Ord.	87–92b	..	
79,185	1	Apl. 26	†2/-	†2/-	Colombo Ltd. Ord.	31/–33/-	..	
24,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	20/–22/-	..	
375,402	1	Apl. 12	1/9½	1/9½	Colonial Gas Assn. Ld. Ord.	23/–25/-	..	
187,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	20/–22/-	..	
2,073,280	Stk.	Feb. 23	5	7	Commercial Ord.	98–101	..	99½
475,000	,,	Dec. 22	8	8	Do 8 p.c. Deb.	68–61	..	
800,000	,,	Sept. 29	11	11	Continental Union, Ltd.	33–38	..	34–36
200,000	,,	Mar. 8	7	7	Do. 7 p.c. Pref.	90–95	..	
787,560	,,	Mar. 8	6½	7	Croydon sliding scale	108–113	..	
408,100	,,	,,	5	5	Do. max. div.	84–87	..	
492,270	,,	Mar. 8	7	10	Derby Con.	110–115e	..	
55,000	,,	Dec. 22	4	4	Do. Deb.	71–73c	..	
209,000	,,	Mar. 8	5	5	East Hull Ord. 5 p.c.	76–79	..	
50,000	,,	Dec. 22	5	5	Eastbourne 5 p.c. Deb.	93–98	..	
1,002,180	10	Mar. 22	†4	†6	European, Ltd.	8–9	..	2⅞–8⅜
15,703,480	Stk.	Feb. 9	5	5/1/4	Gas Light & Coke 4 p.c. Ord.	18/6–19/-f	..	18/7½–18/10½
2,600,000	,,	,,	8½	8½	Do. 8½ p.c. max.	63–65	..	63⅞–64⅜
4,167,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	77–80	..	79–79½
5,602,620	,,	Dec. 22	8	8	Do. 8 p.c. Con. Deb.	60–62	..	60⅝–61
181,315	,,	,,	6	6	Do. 6 p.c. Be'st'd Rd. Db.	103–106	+1	103½
1,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	100–102	..	100⅛
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 8	6⅜	6⅜	Hastings & St L. 5 p.c. Conv	87–90	..	
258,740	,,	,,	5⅞	5⅞	Do. 5½ p.c. Conv.	68–71	..	
70,000	10	Apl. 26	†10	†10	Hongkong & China, Ltd.	18½–14½	..	
178,200	Stk.	Mar. 8	5	5	Hornsey Con. 5½ p.c.	78–81	..	
1,976,000	,,	May 24	10	10	Imperial Continental Cap.	162–167*	..	163–165½
223,130	,,	Feb. 9	8½	8½	Do. 8½ p.c. Red. Deb.	68–70	..	69
235,242	,,	Mar. 8	7	7	Lea Bridge 6 p.c. Ord.	94–97	..	
2,145,907	,,	Feb. 23	5½	5½	Liverpool 5 p.c. Ord.	92½–93½b	–½	
600,000	,,	Mar 22	7	7	Do. 7 p.c. Red. Pref.	101½–103½b	..	
166,786	,,	Feb. 23	9	8	Maidstone 5 p.c. Cap.	106–112	..	
75,000	5	Dec. 22	†7	†8	Malta & Mediterranean	5¼–6	..	
541,920	Stk.	May 24	†5	†7	Montevideo, Ltd.	91–93*	..	94–94½
2,061,815	,,	Mar. 8	5	5	Newcastle & Gateshead Con.	16/8–16/9d/f	–/6	
360,929	,,	,,	4	4	Do. 4 p.c. Pref.	70½–71½d	..	
691,705	,,	June 29	8½	8½	Do. 8½ p.c. Deb.	66½–67½d	..	
131,780	,,	Mar. 8	6/18/0	6/18/0	North Middlesex 5 p.c. Con.	97–100	..	
900,000	,,	Apl. 26	9	7	Oriental, Ltd.	116–121	..	
188,120	,,	Dec. 22	7⅜	7⅜	Plym'th & Ston'house 5 p.c.	108–113	..	
414,500	,,	Feb. 23	7½	7½	Portsm'th Con. Stk. 4p.c. Std.	101–104	..	
236,732	,,	,,	5	5	Do. 5 p.c. max.	77–80	..	
2,534,464	1	—	—	—	Primitiva Ord.	25/9–26/9	+/3	26/–26/7½
244,500	100	June 1	4	4	Do. 4 p.c. Red. Deb.	91–94*	..	
695,000	Stk.	Jan. 26	4	4	Do. 4 p.c. Red. Deb. 1911	76–78	..	
416,845	,,	Dec. 22	4	4	Do. 4 p.c. Cons. Deb.	75–77	..	77½
150,000	10	Mar. 22	6	6	San Paulo 6 p.c. Pref.	8½–8⅝	..	
125,000	50	Jan. 8	5	5	Do. 5 p.c. Red. Deb.	48–50	..	
270,000	Stk.	Mar. 22	6	6	Sheffield A	100–102e	..	
419,988	,,	,,	6	6	Do. B	100–102e	..	
1,047,000	,,	,,	6	6	Do. C	100–102e	..	
90,000	10	May 26	4	6	South African	4–6	..	5 5/8
6,609,895	Stk.	Feb. 23	5	7½	South Met. Ord.	105–107	..	105⅝–107
500,000	,,	,,	—	6	Do. 6 p.c. Irred. Pf.	110–113	..	
1,895,445	,,	Jan. 12	8	8	Do. 8 p.c. Deb.	59–63	..	
784,000	,,	Mar. 8	6½	6½	Do. 6½ p.c. Red. Db.	100–102	..	101⅜–102
91,500	,,	Feb. 23	8½	8½	South Shields Con.	112–113d	+½	
1,243,795	,,	Feb. 23	6½	6½	South Suburban Ord. 6 p.c.	105–108	..	106⅛–107⅛
868,887	,,	Dec. 22	5	5	Do. 5 p.c. Deb.	95–98	..	96½
847,740	,,	Mar. 24	5	5	South'mpton Ord. 5 p.c. max	72–80	..	
121,275	,,	Dec. 22	4	4	Do. 4 p.c. Deb.	73–76	..	
250,000	,,	Mar. 8	7	7	Swansea 7 p.c. Red. Pref.	100–103	..	
200,000	,,	Dec. 22	6½	6½	Do. 6½ p.c. Red. Deb.	99–102	..	
130,000	,,	Feb. 23	7½	7½	Tottenham District A 5 p.c.	115–120	..	
882,275	,,	,,	6½	6½	Do. B 5½ p.c.	93–96	..	95–95½
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	98–101	..	
131,255	,,	Dec. 8	4	4	Do. 4 p.c. Deb.	77–80	..	
239,094	,,	Mar. 8	6½	6 5/16	Uxbridge, Maidenhead, & Wycombe 5 p.c.	90–95	..	
88,880	,,	,,	5	5	Do. 5 p.c. pref.	86–90	..	87½
					Wandsworth, Wimbledon, and Epsom—			
80,000	,,	Mar. 8	8½	8½	Wandsworth A 5 p.c.	129–134	..	
265,686	,,	,,	7	7	Do. B 5½ p.c.	111–116	..	
432,535	,,	,,	5/19/0	5/19/0	Do. C and New	98–103	..	
352,000	,,	,,	6⅝	6⅝	Do. Wimbledon 5 p.c.	106–111	..	
98 000	,,	,,	7½	7½	Do. Epsom 5 p.c.	112–117	..	
200,000	,,	,,	5	5	Do. 5 p.c. Pref	86–91	..	
88,416	,,	Dec. 22	8	8	Do. 8 p.c. Deb.	57–60	..	
284,743	,,	,,	4	4	Do. 4 p.c. Deb.	77–80	..	

Quotations at:—a.—Bristol. .—Liverpool. c.—Nottingham. d.—Newcastle. e.—Sheffield. f.—The quotation is per £1 of Stock. * Ex. div. † Paid free of income-tax. ‡ For year.

Claim for a Gas Economizer.

In the Southwark County Court, on June 11, before Judge Moore, the hearing was resumed and concluded of the action in which Messrs. Hodgkinson & Co., of 33, Union Street, Borough, S.E., restaurant equippers, sued Mrs. Hinton, of Rathbone Place, W., restaurant keeper, to recover £10 for a Stott gas economizer supplied. At the last hearing the defendant said that the economizer was no good to her, as it did not do as it was represented, whereupon the case was adjourned for a test to be made. On Monday, Mr. Philcox, solicitor for the plaintiffs, said that a test showed a saving of 31½ p.ct., which was considerably more than the guaranteed saving. He went on to say that the reading of defendant's meter before it was fitted was 337 therms, and when it was installed it was considerably less than half. Judge Moore observed that as this was the only question, there must be judgment for plaintiffs, with costs.

Omagh Gas-Works Profits.—The auditors reported to the Omagh Urban Council that the gas-works showed a net profit for the year ended March 31 last of £163. It was decided to reduce the price of gas, as from July 1, by 5d. per 1000 c.ft.

Issue of Stock at Reading.—In regard to the £28,910 5 p.ct. perpetual debenture stock which was recently issued by the Reading Gas Company, considerably over twice the amount of stock was tendered for, and no allotments were made at the minimum price of £95 p.ct.; the average price realized being very satisfactory.

Excellent Results at Bangor.—At a recent meeting of the Bangor Council the price of gas was reduced by 4d. per 1000 c.ft. (from 3s. 6d. to 3s. 2d.), as from Sept. 30 next; the salary of the Manager was increased; adjoining ground was taken for extension; and the showrooms were ordered to be enlarged and improved, at a cost of £1500.

Desire for Gas Lighting.—An application was recently made by a number of tenants in Corporation houses at Greenock to have gas installed for lighting purposes in place of electricity. When the matter came before the Corporation it was agreed to submit the proposal to the Board of Health, and a reply has been received in which the Board refuse to sanction any alteration.

Walton-on-Thames and Weybridge Gas Company.—We are informed by Messrs. A. & W. Richards that the tenders sent in for the £12,000 6 p.ct. preference stock which they offered on behalf of the Directors of the Company amounted to £21,200, and ranged from £105 10s. down to the minimum of £103 per £100; the average price obtained for the stock being £104 4s. 11d. p.ct.

Probable Reduction in Price of Glasgow Gas.—It is understood that as the result of successful trading during the past financial year, a further reduction in the charge for gas in Glasgow will be made in the autumn. Already during the year two decreases in the price have been made to consumers. The first reduction was from 5s. 2d. to 4s. 3d., and the second from 4s. 3d. to 3s. 11d. per 1000 c.ft.

Results at Llandudno.—The annual report of the Llandudno gas undertaking was presented at a recent meeting of the Council. The report stated that the number of gas cookers in use was 2593—an increase of 145. Meters numbered 3344 (an increase of 145), water heaters 119, and gas fires and radiators 1056 (an increase of 51). Gas boilers numbered 245—an increase of 65. The make of gas during the year increased from 154,012,000 to 157,147,000 c.ft.

New Gas Price System at Macclesfield.—The Macclesfield Town Council have confirmed the Gas Committee's decision to reduce the price of gas. Consumers are to be given a rebate of 25 p.ct. for gas consumed in the summer quarters and of 5 p.ct. in the winter quarters. The aim, of course, is to level-up the load. In a recent issue of the "Times and East Cheshire Observer," the Chairman of the Committee (Councillor Vernon Hope) explained that last year they not only removed the 20 p.ct. advance due to the coal strike, but, in addition, reduced the prices charged for gas by 1½d. per therm. In spite of these reductions, a further large profit had been made, amounting to £6300—a result which bore testimony to the ability and energy of Mr. H. Curtis, their Engineer and Manager, and his staff.

New Carbonization Retort.—A Company has just been formed, of which Capt. S. R. Streatfeild, M.P., a Director of East Holywell Collieries, Ltd., and Ryhope Collieries, Ltd., is Chairman, to exploit an invention by Mr. Maxwell McGuinness. Prof. A. M. Low is the Consulting Engineer and Dr. H. B. Cronshaw the Consulting Chemist of the Company. The invention is known as the "Positive Retort," and in principle consists, states the "Colliery Guardian," of a series of cylindrical retorts, in the centre of each of which four or three bladed impellers rotate intermittently. It is proposed to proceed immediately with the erection of an experimental battery of retorts with a 50-ton throughput per day. Further particulars can be obtained from the Secretary of the Company, Mr. J. H. Lyden, 46, Basinghall Street, E.C. 2.

Bussey Coal Distillation was registered as a public Company on June 5, with a nominal capital of £280,000 (200,000 8 p.ct. cumulative participating preference of £1, and 800,000 ordinary of 2s.), to acquire from the Bussey Low Temperature Process the license or right to operate throughout Great Britain, Northern Ireland, and the Irish Free State a process for treating coal or other carbonaceous material for the extraction and recovery therefrom of oil, gas, and other volatile hydrocarbon constituents. The Directors are: Mr. A. Powell (Chairman of the Bussey Low Temperature Process, Ltd.), Mr. J. Dunnachie (Chairman and Managing Director of the Glenboig Union Fireclay Company), Mr. J. D. Stobart (Director of William France Fenwick & Co.), Lieut.-Colonel W. H. Benett-Dampier (Director of the Inter-Continent Petroleum Company, U.S.A.), Mr. E. Adamson (Chairman of Adamsons, Sheffield), and Mr. E. Harrison (Director of the Bussey Low Temperature Process).

Gas Propaganda in Castleford.—An exhibition of gas appliances and of smoke abatement literature was a feature of the Castleford civic week, and attracted much public attention. The civic week was followed by a shopping week, during which gas cooking, heating, &c., were again brought to the notice of the public.

Exhibition at York.—During a Civic Week in York, which is being held from June 17 to 23, a Trades and Industries Exhibition is being staged in the Assembly and Festival Concert Rooms. A very attractive stand is being arranged by the York Gas Company. During the week, the Company are opening their works for inspection.

Cheaper Gas in Arbroath.—Gas in Arbroath is to be cheaper during the current year by 4d. per 1000 c.ft. The Gas Committee of the Town Council, following a favourable report by Mr. A. C. Young, the Gas Manager, have reduced the price for ordinary consumers from 3s. 6d. to 3s. 2d., and for prepayment consumers from 3s. 10d. to 3s. 6d. per 1000 c.ft.

Cooking by Gas.—An interesting series of lectures and demonstrations of cooking by gas was given recently in the lecture hall at the Sutton Gas Company's showrooms, 19, High Street. The lecturess was Miss H. Crawford-Fox, who has on previous occasions impressed Sutton audiences with her ability to impart a thorough knowledge of the subject. The demonstrations were held in conjunction with Messrs. Radiation, Ltd., and were well attended throughout.

Gas Prices Lowered at Bradford.—The Bradford Corporation Gas Committee, on June 8, decided to recommend a reduction of a penny per therm (5d. per 1000 c.ft.), with no change in the usual discount, in the charge for gas locally, as from the last meter reading for the half-year ended June 30. The new price will be 9d. per therm gross (7½d. net)—the price before the 1926 coal dispute—for ordinary purposes. For industrial purposes the price will be 7½d. per therm gross (6¾d. net).

Good Working at Rotherham.—The annual report of the Rotherham gas undertaking shows that the net profit for the year ended March 31 amounted to £15,891, as against a loss on the previous year of £11,227. The gross profit was £27,333. The quantity of gas purchased was 403 million c.ft., compared with 369 millions—an increase of 11 p.ct. The quantity of gas sold was 376 millions, compared with 338 millions. This constitutes a record for the Department. After allowing for the cost of public lighting, which is borne by the Department, there remains a balance on the year of £12,557, which has been transferred to the Suspense Account created last year by reason of the deficit caused by the coal stoppage.

Year's Working at Blackburn.—The report of the Blackburn Gas Department shows a gross income for last municipal year of £227,205, and an expenditure of £174,493, leaving a balance of £52,711 carried to revenue account. A reduction of £14,330 in income was accounted for by a reduction of 3d. per 1000 c.ft. in the early part of the year. Maintenance and general charges, mains and services expenditure, &c., were larger than usual through the postponement of work during the previous year. After meeting interest and sinking fund charges of £55,316, there was a net surplus of £2354. Compared with the abnormal demand of the previous year, the total gas sold showed a decrease of 22 million c.ft., but in comparison with the figures of 1925-26 there was an increase of 63 millions, or 7 p.ct. A reduction in the price of gas in the early part of the year was equivalent to a saving of £12,000 to consumers; and as no advance was made during the coal dispute, there is no doubt that the Department is in a high state of financial efficiency, and there should be no difficulty in reducing the price of gas at an early date, or contributing to the relief of rates. Appliances sold during the year were of a total value of £18,600, and the number of cooking and heating appliances in use in 1927-28 was 56,675, against 54,031 in the previous year, and 36,983 in 1920-21. Improvements in mains and services during the past eight years had brought about an enormous reduction in complaints, and what appeared heavy expenditure had been a means of reducing the cost on unproductive work.

The Blackburn Corporation Gas Department had two effective displays in a Trades Exhibition organized in connection with a Rag and Carnival for the benefit of the Royal Infirmary.

The Doncaster Gas Committee have received sanction from the Ministry of Health to the borrowing of £25,600 for mains and £7400 for lamps and meters, in connection with developments of the gas undertaking.

Darwen's Civic Jubilee was celebrated on June 7, when a fine procession of trade and other vehicles took place. The Darwen Corporation Gas Department gained the first award in the trade vehicle (heavy horse) class.

A verdict of "Accidental death" was returned at the resumed inquest at Blackburn, on June 7, on L. N. Adcroft, who, as already mentioned in the "JOURNAL," died from injuries received while working with his son on a crane at the Oswaldtwistle Gas-Works.

A verdict of "Accidental death" was returned at the inquest, closed on June 7, on Walter Bailey (61), who died at the Huddersfield Infirmary as the result of burns received in a sudden flare of a pocket of gas, ignited by a spark from shovel or pick while men were cleaning out a purifier box at the Huddersfield Corporation Gas-Works on May 21.

Employees of Dougall's Gas Meters, Ltd., held their sixth annual outing at Hastings on June 9. In the unavoidable absence of Mr. James Dougall, the Chairman of the Company, Mr. R. V. Steed (a Director) presided at the luncheon, and was supported by Mr. A. H. Telford (Works Foreman), Mr. H. Madell (Auto Shop Foreman), Mr. E. Williams (Chief Clerk), and Messrs. R. E. Ford and S. J. Pope. Messrs. H. Capel and E. Cordwell, the stewards, carried out their duties in an efficient manner; and a most enjoyable day was spent by all.